United Nations Environment Programme

UNEP

Environment and Economics Unit

EEU

Environmental Impact Assessment
Training Resource Manual

Preliminary Version June 1996

UNEP United Nations Environment Programme
UNEP

Environmental Impact Assessment
Training Resource Manual

prepared for the United Nations Environment Programme (UNEP)
by
the Environment Protection Agency, Canberra, Australia
(Bronwyn Ridgway, Mary McCabe, John Bailey, Robin Saunders, Barry Sadler)
under the guidance and technical support of
the UNEP International Working Group on EIA

Prepared for the United Nations Environment Programme by the Australian Environment Protection Agency.

Preliminary Draft June 1996

For enquiries, inputs, and feedback on the outcome of testing of this document please contact:

Environment and Economics Unit
United Nations Environment Programme
Box 30552
Nairobi, KENYA

Phone: +254 2 62 3372/1
Fax: +254 2 62 4268
email: hussein.abaza@unep.org

Assessment Policy and Coordination Section
Environment Protection Agency
40 Blackall Street
Barton 2600
AUSTRALIA

Phone: +61 6 274 1936
Fax: +61 6 274 1620
email mmc@epa.erin.gov.au

For manual updates and contact lists on Internet access the EIA Network on the Australian Environment Server at

http://www.erin.gov.au/net/eianet.html

Designed and typeset by Anne Charlton

Printed in Canberra, Australia, on 100% recycled paper

Foreword

This manual presents training resource materials for one of the core elements of integrated environment and development decision-making – environmental impact assessment (EIA). EIA is a well established and tested process for project planning and management. By ensuring that human and economic activity is adjusted to meet resource and ecological constraints it has become one of the key mechanisms for promoting sustainable development. The main objective of the Training Resource Manual is to enable trainers in developing countries to develop and produce site- and situation-specific training courses for the different target groups concerned, in whatever capacity, with EIA . The use of the manual will contribute directly to the building of local capacity to develop EIA procedures and legislation, to conduct EIA, and to administer, monitor and evaluate the implementation of EIA.

EIA exhibits several of the key requirements for sustainable development. It is:

- *a foundation tool* – providing a sound basis of institutional development;
- *well positioned for the next steps* – providing a stepping stone to other integrative and strategic modes of analysis;
- *recognizably successful* – providing demonstrable benefits in the form of ecologically sound development, and fostering the inculcation of new policy values; and
- *well suited to future capacity building* – providing a 'hands on' means of professional and institutional strengthening.

The manual is one component of UNEP's integrated programme in Environment and Economics, which is directed to enhancing EIA capacity particularly in developing countries and countries in transition to market economies. This programme has been implemented by the UNEP Environment and Economics Unit in response to specific requests made at the United Nations Conference on Environment and Development (UNCED) and its Agenda 21, held in Rio de Janeiro in 1992, and UNEP Governing Council decisions.

To implement the recommendations of UNCED and the decisions of UNEP's Governing Council, UNEP convened an expert group meeting in October 1993 to assist in the development of a programme and a plan of action for EIA. In addition, the Environmental Assessment Summit, convened jointly by the International Association for Impact Assessment (IAIA) and the Federal Environmental Assessment Review Office (FEARO) [now the Canadian Environmental Assessment Agency (CEAA)] in Quebec, Canada in June 1994, emphasized capacity-building in EIA as an urgent priority. It specifically recommended 'clarifying the concept of EIA capacity-building and actively supporting and coordinating capacity-building initiatives'. UNEP was entrusted with the responsibility of establishing a working group to address this issue.

Immediately after the Summit, a series of working group meetings were held in Quebec to discuss and agree on the course of action to be adopted. The meetings, which were coordinated by UNEP, were attended by a core group of international experts attending the Summit and the IAIA Conference which was held after the Summit and at the same venue. The working group identified the need for the preparation of a Training Resource Manual (a generic set of basic training elements) that could be adapted to meet the specific needs of countries.

Bilateral, multilateral, UN organizations and other development assistance organizations have over the years generated numerous training manuals and materials for EIA. These quite often lacked coherence and consistency, were not relevant to developing country needs and realities, and lacked clear objectives of what the courses intended to achieve and what follow-up action was necessary. Nor were they demonstrably part of long-term programmes for enhancing the capacity of countries in EIA.

As a result, training courses and programmes in EIA provided by various international development assistance organizations quite often generated confusing signals in the recipient countries. This was mainly due to lack of coordination of training programmes; heightened expectations because of the training; irrelevance to recipient country needs, social and cultural backgrounds, level of economic development, and institutional, financial and human resource capabilities; and the non-involvement of developing country practitioners and technicians in the design of such programmes.

The manual represents a departure from earlier approaches in the sense that it does not provide an already designed training course or a programme for a specific target group in a particular country; rather, it is a tool for trainers to assist them in preparing courses targeted for specific groups and relevant to the existing political, social and economic climates and development priorities in the country in question. It represents the starting point for a comprehensive programme of training to support capacity building for sustainable development.

UNEP is actively engaged in building global EIA capacity. It is undertaking this task in a number of distinct but related ways. In addition to this document, it has prepared an *EIA: Issues, Trends and Practice* document with useful examples, suggestions, advice and recommendations for incorporation in the training modules of this document. The documents are preliminary versions, intended to be revised and updated through feedback received from tests and trial runs.

This manual concentrates on training materials which will support practical, clear and coherent approaches to EIA. It emphasizes the development of a second generation of EIA which has to focus, among other things, on the need to:

- move from the conventional view of EIA being dealt with as separate and isolated exercise into a more integrative view;
- integrate EIA into the development planning process;
- use EIA not just to assess negative impacts but also to promote the positive impacts of projects, programmes and policies;

- use EIA as a development and planning tool for sustainable development;
- develop EIA as a practical and cost-effective tool for integrating environment and development in decision-making at the policy, programme and project level;
- integrate physical, social, economic and environmental analyzes and assessment of projects, programmes, and policies;
- encompass transboundary effects, assessing the impact of trade policies, budgets, structural adjustment programmes, national plans and projects of a regional nature;
- develop approaches for the integration of EIA and environmental economic valuation including Cost-Benefit analysis; and
- include monitoring within the EIA process.

The manual is designed to assist trainers to design and implement training courses of varying content and length for five broad target groups:

- trainers, with limited or extensive experience, who need to develop situation-specific training courses in awareness of EIA, developing EIA procedures, conducting EIA or administering, monitoring and assessing EIA;
- practitioners, at whatever level their knowledge of EIA, who intend to undertake EIA and who need to develop sufficient skills to carry out the process. This group could include private sector consultants, university staff, officials in resource management agencies, officials in district or regional authorities, or local donor/lending agencies;
- managers, potentially also with some, little or no previous exposure to EIA, whose responsibilities may include designing terms of reference for EIA processes, managing and monitoring the EIA process, evaluating the results, and planning and monitoring implementation recommendations from the EIA. These managers may be from the private or public sector, representing government, donor agencies or the investors responsible for implementing proposed projects;
- decision and policy makers with little or no previous exposure to EIA who need to develop an appreciation of the need for the process, the key objectives and features of the process and some concept of the process itself; and
- members of the public, NGOs and other relevant organizations who will probably have little or no experience of, or exposure to, EIAs. They need to be exposed to the concept and to develop an appreciation for the need for EIA as it relates to their organizations, the key objectives, the process itself, and what to do with the outcome of EIAs.

The manual has four main sections. The first three give guidance and information about how to establish, support and present a training programme. The fourth section presents specific training materials and resources in a series of thirteen training topics generally agreed to be the building blocks in effective EIA. In these, session outlines are designed to encourage the trainer to modify and supplement materials to meet the identified needs for strengthening existing systems and the needs of individual course participants.

As an introduction, Topic 1 examines the background history and role of EIA. Topic 2 establishes an understanding of the way in which an EIA system can be developed and supported to meet the needs of sustainability. It provides guidance and suggests ways in which the experience of others can be built upon to produce relevant and effective EIA processes. Topic 3 explores the important role of public involvement, outlining the many advantages to be gained from seeking public input at an early stage in the EIA process and some of the pitfalls to be avoided in this part of the process.

Topics 4 to 11 deal with traditionally recognized stages of the environmental impact assessment process – from the identification of projects that require EIA through to decision-making and implementation.

Topic 12 examines the role of the project manager and provides insight into ways in which this task can be carried out effectively. Topic 13 looks to the future of EIA as a strategic planning tool for moving towards sustainability.

I am confident that the techniques and materials in the manual will be successful in encouraging a range of innovative approaches to the important task of establishing and supporting effective and relevant EIA processes at policy, programme and project levels.

Hussein Abaza, Chief
Environment and Economics Unit
UNEP, Nairobi
June 1996

Acknowledgements

These training materials are the result of the cooperative efforts of a number of international experts committed to supporting environmental assessment as a major part of capacity building for sustainable development. The process of their preparation has been characterized as being transparent, participatory and open. They represent the views and concerns of a wide range of people with differing experiences and backgrounds. The manual has benefited extensively from the guidance and input of the UNEP established international working group of EIA experts, who have reviewed the document at three meetings sponsored by UNEP in Nairobi (January 1995), Durban (June 1995) and Geneva (January 1996).

UNEP is especially grateful to Barry Carbon, Mary McCabe and Bronwyn Ridgway of the Environment Protection Agency, Australia, and John Bailey, Robin Saunders and Patricia Pedicini for their input and their efforts in the preparation of this document. The advice and encouragement of the following group members was invaluable in determining the information to be included, and the form and content of this document: Hussein Abaza (UNEP, Head of Expert Group), Susan Becker (UNDP), Ron Bisset (Scott Wilson Resource Consultants), Elizabeth do Nascimento Brito (PPA, Brazil), Shem Chaibva (International Council for Local Environmental Initiatives, Zimbabwe), Barry Dalal-Clayton (IIED), Peter Croal (CIDA), Robert Goodland (World Bank), Hans Gortworst (Geoplan, The Netherlands), Paddy Gresham (IUCN), Mohammed El Halwagi (Ministry of Scientific Research, Egypt), Ram Khadka (IUCN, Nepal), Remi Paris (OECD), Maria do Rosário Partidário (New University of Lisbon), Renat Perelet (Institute for Systems Analysis Academy of Science, Russian Federation), John Raimondo (African Environmental Solution Pty Ltd, South Africa), Husain Sadar, (Carleton University, Canada), Barry Sadler (International Study of the Effectiveness of Environmental Assessment, Canada), Bob Weir (CIDA), Samson Werikhe (Uganda National Park Service). The contributions of other experts who attended some of the meetings are gratefully acknowledged: Fritz Balkau (UNEP-IE), John Boyle (Zimbabwe Natural Resources Management Programme), Horst Breier (OECD), Arne Dalfelt (World Bank), Abdoulaye Sene (Institut des Sciences de l'Environment, Senegal) and Anne Marie Skjold (IUCN, Kenya).

At the end of each topic section there are detailed acknowledgments of the many authors whose texts provided the basic materials for the compilation of the session notes. In some cases material being produced for the International Study of the Effectiveness of Environmental assessment has been used, although it is not yet in published form. Case studies of EIA in developing countries, compiled for UNEP by Barry Sadler, have been extensively used as has material from the companion document EIA: Issues, Trends and Practice developed for UNEP by Ron Bisset, under the guidance and technical support of the UNEP International Working Group on EIA.

Finally, thanks to all of those who provided copies of existing EIA manuals.

This Manual at a Glance

This manual is designed to support the building of capacity in Environmental Impact Assessment (EIA) through training and the encouragement of networking among environmental professionals. It is intended to provide an understanding of, and basic capability in, the application of EIA. It can be used by trainers who have some background experience and understanding of EIA to:

- *identify training needs; and*
- *facilitate the design and delivery of training courses.*

A range of courses can be prepared using the manual. For instance, a short presentation can be designed for high ranking government officials to introduce the benefits of the process and its role in sustainable development. Alternatively, a month long course can be designed for EIA practitioners who require a detailed understanding of all of the stages involved in the EIA process.

The information and materials contained in the manual can be used to support the design and presentation of courses. More importantly, the manual can be used to help the trainer identify local sources of information and contacts that can be used to make the training more relevant, useful and interesting to the course participants.

This manual is published in a preliminary form that is to be released and trialed in learning situations. Interested users are invited to give comments on both the contents and use of the package so that new ideas, suggestions and corrections can be incorporated before final publication.

Manual design and content

The manual is in four main sections:

Section A	introduces the manual and outlines its role in capacity building.
Section B	contains the outline of a Training Needs Analysis, some or all of which can be used to identify or confirm the specific training requirements.
Section C	contains advice on how to design, present and evaluate training courses.
Section D	is a series of training topics addressing the key steps involved in the EIA process. These topics are all in a similar format and provide session outlines; a selection of training activities; a reading and list of other references; as well as other resource materials such as overhead projector sheets and handouts.

Capacity Building

This section of the manual outlines the role of training in capacity building and provides lists of contacts and references that can be used to obtain additional information about the EIA process.

Training Needs Analysis

This section of the manual first provides guidance about collecting background EIA information and materials that are required before the assessment of training needs can take place. It then provides a detailed session outline of a training needs analysis workshop that can be used to identify or confirm the specific training needs, and to highlight any influence that the economic, political and social contexts of EIA may have on the presentation of the course. A workshop can run over one or two days and bring together a cross-section of EIA stakeholders.

The full workshop may not always be needed if the training needs are very clear and the context in which the training is undertaken is well understood.

Finally, this section on the analysis of training needs contains a short questionnaire that can be completed by each course participant before a course begins so that the trainer can gain an understanding of their individual needs.

Course Design, Delivery and Evaluation

This section provides the tools to:

- develop course outlines
- present courses effectively
- prepare participant handbooks
- evaluate the success of a course

Training Topics

A series of training topics is provided. These are focused on the key stages of EIA and other important related issues.

The training topics are structured to provide

- background materials in the form of session outlines;
- training activities including detailed group activities and themes for discussion or speakers;
- references; and
- resource materials.

These materials have been packaged to encourage the trainer to incorporate local materials and information. The trainer should add or delete materials to suit the needs of the participants as identified during the training needs analysis.

It is envisaged that practitioners developing new country-specific materials will make these available to their colleagues and will build up a network of training and practitioner contacts to encourage this exchange of materials.

Layout of sections

Icons

The margin icons appear in each of the Training Topic sections and are designed for the quick identification of other actions, or materials, that contribute to the training.

OHP	indicates that an overhead projection transparency is available at the end of the topic and can be shown at this time to illustrate a point, or to sum up ideas introduced in the session.
Handout	indicates a handout which can be copied from the resource materials supplied at the end of each topic.
Proforma	reduced-size tables and diagrams are often included in the text. The proforma icon indicates that full-sized proforma sheets are available for copying at the end of the topic.

Table of Contents

Section A — Capacity Building

Introduction 1
Benefits of EIA training 2
Who should be a trainer? 4
Building a contact list and exchanging information 5
Sources of information 12

Section B — Training Needs Analysis

Introduction 15
Part 1: Gathering information about the EIA system and experience 17
Part 2: Analyzing the training needs — the training needs workshop 21
Participant pre-course questionnaire 27

Section C — Course Design, Delivery and Evaluation

Making the arrangements for a course 41
Designing a training course 43
Presenting the training course 51
Preparing participant handbooks 58
Evaluation of training 59

Section D — Training Topics

Guide to using the topic materials

EIA Topics

Topic 1 Introduction and Overview of EIA 65
Topic 2 Law, Policy and Institutional Arrangements for EIA Systems 137
Topic 3 Public Involvement 191
Topic 4 Screening 231
Topic 5 Scoping 285
Topic 6 Assessing 325
Topic 7 Mitigation and Impact Management 425
Topic 8 Reporting 463
Topic 9 Reviewing 509
Topic 10 Decision-making 555
Topic 11 Monitoring, Implementing and Auditing 581
Topic 12 Project Management 633
Topic 13 Future Directions 685

Acronyms and Glossary

Index

Introduction

Capacity building is the long-term, voluntary process of increasing the ability of a country to identify and solve its own problems and risks, and to maximise opportunities.

In this context, countries should be moving as far as possible towards self-sufficiency in environmental impact assessment. Where outside experts need to be engaged, then the opportunity should be taken to transfer expertise to local personnel.

A country's efforts to build EIA capacity will be most effective when carried out in a strategic and planned way rather than relying upon the assessment of individual projects. This manual provides the necessary tools (in Section B) to enable trainers to develop courses that will enhance capacity building in EIA.

Capacity building can be carried out by developing and implementing educational and training programs. It also requires long-term commitment for strengthening educational and research institutions. Training can be done at many different levels and over different periods of time to meet a variety of needs. Long-term programs might be used to train university graduates as EIA practitioners, whereas short-term training courses might be used to raise awareness of the process or train people in specific techniques.

Although the necessity of environmental education and training is no longer questioned, there is still a large gap in many countries between policy and action. There are many reasons for this, notably lack of financial resources and political or social elements which do not support training and development. In a situation of limited options, countries must use whatever tools are available to achieve their economic, social and environmental goals. One of these tools is environmental impact assessment. Application of EIA to the planning and decision-making process is not necessarily expensive and can be well integrated into an existing planning cycle. As well, training an individual in the process of EIA is not a complex task.

A complete capacity building program will need to provide a range of aids that can be used to engender skill development and knowledge transfer. These can include:

- *developing a library of environmental assessment reports;*
- *maintaining a database of information collected during an EIA;*
- *establishing a network of practitioners with experience in EIA or technical analysis;*
- *collecting examples of good practice*
- *producing an environmental assessment newsletter;*
- *holding environmental art contests;*

- *establishing environmental awards in the workplace;*
- *inviting guest speakers on environmental issues;*
- *holding an environment 'day' or 'week';*
- *producing desk aids such as a yearly calendar based on environmental themes;*
- *developing corporate policies or guidelines on the environment;*
- *designing corporate environmental posters;*
- *developing corporate environmental programs; and*
- *establishing environmental stewardship activities.*

Benefits of EIA training [1]

This is a world with increasing environmental problems. Many countries are responding to these problems by enacting environmental legislation or implementing policies which attempt to consider the environment in the decision-making cycle. Industry is also increasingly incorporating environmental assessment and management into its business cycles. For whatever reasons—environmental, legal or profit driven—there are limited resources available, both in terms of money and natural resource capital. This is forcing public and private sector institutions to use available resources more wisely to meet their respective needs.

EIA is a powerful process that can assist a decision-maker to bring into focus all the economic, social and environmental factors that could affect the project directly and society indirectly. Environmental issues have also generated a huge new growth in the environmental industry sector which is growing at about nine percent a year. If there exists an environmental problem today, one can be assured that there are companies positioning themselves so that a profit can be made from the problem whether it is through waste clean up, recycling or EIA consulting. The requirement for environmental expertise and technology is not expected to abate.

According to Sidney (1992), the benefits of environmental training are as follows:

Legal and economic

Training will assist an institution in avoiding costly and time consuming legal challenges. It will also provide more opportunities for the institution to benefit from the growing environmental industry sector. The training will also ensure that resources required for a particular project are used in the most sustainable way possible.

Motivation

Environmental issues can strengthen management links in an organisation at all levels. Training can bring a common focus to divergent agendas within the organisation and can instil more sense of purpose and identity. Most employees respond in a positive manner to well designed projects that benefit the environment, contribute to health and safety or improve the quality of life. Many institutions are strengthening the morale and pride of the organisation by having internal recognition programs for activities that benefit the environment, and there is now a growing recognition that organisations that benefit the environment are better corporate and societal citizens than those that do not. This can result in positive public sentiment and increased business.

Developing multisectoral expertise

Project design and implementation is not as straightforward as it once was. There is increased public scrutiny, environmental legislation, diminishing or degraded natural resource bases and social and cultural transformation. Taking these kinds of issues into account requires an expanded knowledge base in order to acquire the right amount and right kind of information to make a decision. Environmental training is now being linked to training in other technical and management subjects. This will result in institutional knowledge which is more multidimensional, competitive and proactive to take advantage of the opportunities that environmental issues present.

Interpersonal skills

Interpersonal skills development has enormous potential for growth when this is linked to environmental issues. Lateral thinking is now the cornerstone of many problem solving exercises concerning the environment. This form of problem solving can lead to the development of skills related to consensus building, resolving conflict and negotiation. Also, presentation of environmental issues can link with training in presentational skills. Individuals with specific environmental responsibilities may need to be trained in a range of managerial skills as well as environmental issues. Many environmental problems can only be managed if there is an element of compromise involved. Attaining compromise requires individuals who can understand all sides of the problem and can manage a multitude of important and sensitive personnel and institutional agendas to arrive at a reasonable and practical solution.

Community link enhancement

Many environmental issues can only be solved by a multidisciplinary approach that has links to the beneficiaries of the project, the communities affected, government and other private or public sector interest groups. Effective problem solving can lead to heightened understanding of respective interests, increased commitments to an organisation and nurturing of the critical element of community goodwill. A well planned environmental training program with links to other training programs becomes a more powerful training tool which can maximise the cost effectiveness of the training budget. It will also forge constructive satisfaction on which all competent organisations thrive, and develop the values which hold the organisation together. These values can inevitably be demonstrated through the relationship that an organisation can develop with surrounding communities. The British based firm called Body Shop has demonstrated clearly that a commitment to environmental values pays huge dividends through increased business opportunities, community satisfaction and the fostering of active environmental stewardship in staff and customers.

Finally, environmental training is becoming more important in the avoidance and alleviation of many environmental problems. Many social and health problems related to environmental degradation put an unmanageable stress on governments' available financial resources. Also, more and more bilateral and multilateral donor agencies are developing and implementing environmental assessment requirements as part of the aid delivery programs. For countries to be able to tap these resources in an increasingly competitive donor community, they need to be able to demonstrate that they can undertake environmental assessments if these are a condition to the funding agreement.

Who should be a trainer?

EIA practitioners, administrators or university lecturers with an EIA background will all have sufficient background knowledge to use these training resource materials. Courses will be more stimulating when a variety of presenters is available, as each can pass on individual knowledge and experience.

References

[1] Sadar, M.H., with contributions from P. Johnson, D. Barnes, P. Croal (1996) *Environmental Impact Assessment, 2nd edition,* Carleton University Press, Ottawa, Canada.

Sidney, E., (1992) Reaping all the benefits of Environmental Assessment, *International Journal of Environmental Studies*, Volume 42, pp. 107-114.

Building a contact list and exchanging information

On the next few pages can be found a list of EIA contacts. This list is very general but can be used by trainers as a starting point for building their own networks to support EIA training and institutional support for the process.

The early stage of the training needs analysis will generate names and contact information for major participants in the EIA process. It is important to build on this, identifying local people with an interest in, or knowledge of, EIA. This will be helpful when seeking experienced speakers and session leaders for course work. With each training course run there will also be valuable contacts made between participants, and this should be supported as far as possible by providing participant lists in the handbooks that are prepared for course members.

Where an in-depth analysis of training needs is carried out, the information should be shared freely with other trainers as well as with identified stakeholders. Materials obtained through the preparation of courses and from course participants should be retained and could be circulated or catalogued as part of the capacity building exercise. In particular, case study material identified during training can be fed back into the system at the regional and country level, and at an international level through the numerous electronic EIA networks now being developed, access to which is freely available through Internet.

EIA contacts

The following contacts may be useful to EIA trainers developing materials based on the outlines in this manual. The list has been compiled primarily from listings distributed by the EIA Centre, Manchester University. The Centre issues regular updates of these lists as part of its *EIA Leaflet Series* and welcomes additional information, especially from trainers in developing countries. For updates please contact:

EIA Centre
Department of Planning and Landscape
University of Manchester
Manchester M13 9PL
United Kingdom
Telephone: 44 161 275 6873 Fax: 44 161 275 6893
Email: johughes@man.ac.uk

INTERNATIONAL ORGANISATIONS OF RELEVANCE TO EIA

1. United Nations Organisations

Environment and Economics Unit
The United Nations Environment Programme (UNEP)
Post Box 30552
Nairobi
Kenya
Telephone: 254 2 6233 72 Fax: 254 2 2268 90
Email: hussein.abaza@unep.no

Infoterra (global environmental information exchange network of UNEP)
Post Box 30552
Nairobi
Kenya
Telephone: 254 2 62 1234 Fax: 254 2 62 4269
Email: infot.inf@unep.no

Industry and Environment Office
UNEP
39-43 quai André Citroën
75739 Paris Cedex 15
France
Telephone: 33 1 44 37 14 50 Fax: 33 1 44 37 14 74
Email: unepie@unep.fr

United Nations Economic Commission for Europe (UNECE)
Environment and Human Settlements Division
Palais des Nations
CH 1211 Geneva 10
Switzerland
Telephone: 41 22 917 2448 Fax: 41 22 907 0107
Email: schrage.ece@unog.ch

United Nations Economic and Social Council for Asia and the Pacific (ESCAP)
United Nations Building
Rajdamnern Avenue
Bangkok 10200
Thailand
Telephone: 66 2 282 9162 Fax: 66 2 282 9602
Email: Karim.unescap@un.org OR Khan.unescap@un.org

International Environmental Technology Centre (UNEP)
Osaka Office
2-110 Ryokuchi koen
Tsurumi-ku
Osaka 538
Japan
Telephone: 81 6 915 4580/91 Fax: 81 6 915 0304
Email: khiguchi@unep.or.jp

Bureau For Coordination Of Environmental Programmes
United Nations Educational Scientific and Cultural Organisation (UNESCO)
1 rue Miollis, 75732 Paris Cedex 15
France
Telephone: 33 1 45 68 1000 Fax: 33 1 45 67 1690
Email: g.glaser@unesco.org

United Nations Industrial Development Organisation (UNIDO)
PO BOX 300
A-1400
Vienna
Austria
Telephone: 43 1 21131 4697 Fax: 43 1 21131 6803
Email: rrigola@unido.org

Food and Agricultural Organisation (FAO)
Programmes Coordinating Centre
Environment and Energy
Via delle Terme di Caracalla
00100 Rome
Italy
Telephone: 39 6 522 51 Fax: 39 6 522 53152
Email: jeff.tschirley@fao.org

International Labour Office (ILO)
Focal Point for Environment and Sustainable Development
4 route des Morillons
CH 1211 Geneva 22
Switzerland
Telephone: 41 22 779 74 56 Fax: 41 22 798 86 85
Email: kohler@hql.ilo.ch

The World Health Organisation (WHO)
Environmental Hazards and Food Protection
20 Avenue Appia
1211 Geneva 27
Switzerland
Telephone: 41 22 791 2111 Fax: 41 22 791 0746
Email: postmaster@who.ch

2. Organisation for Economic Co-operation and Development (OECD)

- Development Co-operation Directorate; and
- Environment Directorate

both at:
2 rue Andre Pascal
75775 Paris Cedex 16
France
Telephone: 33 1 45 24 8200 Fax: 33 1 45 24 1996
Email: Remy.Paris@oecd.org

3. Multi-National Aid Agencies and Development Banks

African Development Bank
B.P.V. 316
Abidjan
Cote D'Ivoire
Telephone: 225 20 4199 Fax: 225 20 4907
Email: adbabjacos.gn.apc.org

Asian Development Bank
Office of the Environment
PO Box 789
1099 Manilla
The Philippines
Telephone: 632 711 3851 Fax: 632 741 7961
Email: www@mail.asiandevbank.org

European Bank for Reconstruction and Development
Public Infrastructure
Energy and Environment Department (1992)
One Exchange Square
London EC2A 2EH
Telephone: 44 71 338 6000 Fax: 44 71 338 6100

Inter-American Development Bank
Environment Division
Department of Social Programs & Sustainable Development
1300 New York Avenue
N.W. Washington D.C. 20577 USA
Telephone: 1 202 623 1000 Fax: 1 202 623 3096
Email: waltera@iadb.org

World Bank
Headquarters:
Environmental Economic and Pollution Division
Environmental Department
1818 H. Street N.W.
Washington D.C. 20433 USA

Environmental Assessment Internet addresses:
1. EA policy and methodology: rgoodland@worldbank.org
2. Pollution standards: asomani@worldbank.org
3. EA implementation: rjedwood@worldbank.org
4. EA internal training: rrobelus@worldbank.org
5. EA external training: pharou@worldbank.org
6. EA Sourcebook Updates: okjorven@worldbank.org

For country & project specific EA summaries etc:
7. Public Information Center (PIC)
Room G, C1-310
World Bank
Washington D.C. 20433
USA
(requests to PIC need country, project name & year)
Fax: 1 202 477 6391
Email: gopher.worldbank.org
Internet site: http://www.worldbank.org//

Europe office
66 Avenue d'Iena
75116
Paris
France
Telephone: 33 1 40 69 3000 Fax: 33 1 40 69 3066

Tokyo Office:
Kokusai Building
1-1 Marunouchi 3-chrome
Chiyoda-ku
Tokyo 100
Japan
Telephone: 81 3 3214 5001 Fax: 81 3 3214 3657

4. International NGOs

EIA Centre
Department of Planning and Landscape
University of Manchester
Manchester M13 9PL
United Kingdom
Telephone: 44 161 275 6873 Fax: 44 161 275 6893
Email: johughes@man.ac.uk

Institute for European Environmental Policy (IEEP)
London Office:
158 Buckingham Palace Road
London SW1W 9TR
United Kingdom
Telephone: 44 71 824 8787 Fax: 44 71 824 8145
Email: ieeplodon@gn.apc.org.uk

Paris Office:
Institute pour une Politique Européenne de l'Environnement (IPEE)
28 rue des petites Ecuries
75010 Paris, France
Telephone: 33 1 44 83 92 03 Fax: 33 1 44 83 92 04
Email: ipec@club-internet.fr

Berlin Office:
Ecologic
Haus der Demokratie - FriedrichStrasse 165
10117 Berlin
Telephone: 49 30 229 91 94 Fax: 49 30 229 94 93
Email: Ecologic@eworld.com

Bruxelles Office:
Institut pour une Politique Europeenne de l'Environnement (IPEE)
c/ECAS - Rue Defacqz, 1
1050 Bruxelles
Telephone: 32 2 534 95 66 Fax: 32 2 534 52 75
Email: ipee@club-internet.fr

Arnhem Office:
Instituut voor Europes Milieubeleid (IEMB)
Jansbuitensingel 7
NL-6811 AA Arnhem
The Netherlands
Telephone: 31 26 42 2929 Fax: 31 26 45 3210
Email: ieep_nl@compuserve.com OR
101610,2476@compuserve.com

Madrid Office:
Instituto para la Politica Ambiental Europea (IPAE)
Donoso Cortes, 65/4a planta
28040 Madrid
Telephone: 34 1 394 63 91 Fax: 34 1 394 64 22

International Association for Impact Assessment (IAIA)
North Dakota State University
Hastings Hall, PO Box 5256
Fargo, ND
58105-5256
USA
Telephone: 1 701 231 1006 Fax: 1 701 231 1007
Email: jhowell@ndsuext.nodak.edu

International Institute for Environment and Development (IIED)
3 Endsleigh Street
London WC1H 0DD
United Kingdom
Telephone: 44 71 388 2117 Fax: 44 71 388 2826
Email: iiedepg@gn.apc.org

The World Conservation Union (IUCN)
Conservation Services Division, IUCN
rue Mauverney 28
CH-1196 Geneva
Switzerland
Telephone: 41 22 999 00 01 Fax: 41 22 999 00 02

Impact Assessment Centre
Carleton University
1125 Colonel By Drive
Ottawa, Ontario
Canada K1S 5B6
Telephone: 1 613 520 9002 Fax: 1 613 520 9005
Email: impact_assessment_centre@Carleton.ca

ELECTRONIC NETWORKS

Canadian Environmental Assessment Agency
http://www.ceaa.gc.ca/

Department of Environmental Quality Promotion, Thailand
http://www.rectec.or.th/bureaux/moote.html

Department of the Environment, UK
http://www.open.gov.uk/doe/dochome.html

Environmental Affairs & Tourism, South Africa
http://www.Polity.org.za/lists/govdepts.html#DOEAT

Environment Canada
http://www.doe.ca

EPA Australia
http://www.erin.gov.au/net/eianet.html

International Association for Impact Assessment
http://IAIA.ext.NoDak.edu/IAIA/

Minstry of Environment, Norway
http://www.statkart.no/md

Ministry of the Environment, Singapore
http://www.gov.sg/government/moenviron.html

OECD
http://www.oecd.org

UNEP
http://www.unep.org

USA EPA/Purdue Software
Software for Environmental Awareness
http://glnpogis2.r05.epa.gov/glnpo/edu/sea/seahome.html

Sources of information

Journals

Environmental Impact Assessment Review. Elsevier Sciences Publishing. New York, USA.

Impact Assessment. International Association of Impact Assessment. North Dakota, USA.

Journal of Environmental Management. Academic Press. London, UK.

Journal of Environmental Planning & Management. Abingdon, Carfax Pub. Co. for the University of Newcastle Upon Tyne.

Journal of Planning and Environmental Law. Sweet and Maxwell. London, UK.

The Environmental Professional. Blackwell Science. Cambridge Massachusetts, USA.

Project Appraisal. Beech Tree Publishing. Guildford, Surrey. UK.

Information leaflets

The World Bank *Environmental Assessment Sourcebook Updates*.
For details or copies, refer to World Bank's Environmental Assessment Internet addresses listed in section 3, Multi-National Aid Agencies and Development Banks.

Impact Assessment Centre, Carleton University, *Paper Series*.
For details or copies, refer to the Impact Assessment Centre listed in section 4 of the EIA contact list.

EIA Centre, University of Manchester *EIA leaflet series*

L1	EIA Centre and its Publications
L2	Useful Contact Points for EIA Trainers
L3	Sources and Types of Published Information on EIA
L4	Recent EIA Articles
L5	EIA Legislation, Regulations and Guidelines in the EEC
L6	EIA Centre Information Service
L7	One Month Course on Environmental Impact Assessment
L8	Organising Training Courses on Environmental Impact Assessment
L9	Preparing Training Case Studies on Environmental Impact Assessment
L10	Key References for the Evaluation of Landscape Impacts within EIA
L11	Reviewing Environmental Impact Statements
L12	EIA Guidelines
L13	Strategic Environmental Assessment
L14	Five Year Review of the Implementation of the EIA Directive
L15	EIA in Developing Countries

Books and other publications

ADB (1992) *Environmental Assessment Guidelines*. African Development Bank and African Development Fund, Abidjan.

Birley, M. H. (1995) *The Health Impact Assessment of Development Projects*. HMSO. London, UK.

Birley, M.H. & Peralta, G.L. (1992) *Guidelines for the Health Impact Assessment of Development Projects*. Environment Paper No. 11. Asian Development Bank, Manila.

Biswas, A.K. and Agarwala, S.B.C. (eds) (1992) *Environmental Impact Assessment for Developing Countries*. Butterworth-Heinemann Ltd. Oxford, UK.

Biswas, A.K. and Geping, Q. (eds) (1987) *Environmental Impact Assessment for Developing Countries*. Tycooly Publishing. London, UK.

CEC (1993). *Sectoral Environmental Assessment Sourcebook* (Environment Manual). Commission of the European Communities, Directorate-General for Development, Brussels. (415 pp)

Carpenter, R.A. & Maragos, J.E. (1989) *How to Assess Environmental Impacts on Tropical Islands and Coastal Areas*. South Pacific Regional Environment Programme Training Manual. Environment and Policy Institute, East-West Center, Honolulu.

CCIC (undated). *Environmental Screening of NGO Development Projects*. Canadian Council for International Co-operation, Ottawa.

Commission of the European Communities, Directorate-General for Development, (1993) *Environment Manual Environmental Procedures and Methodology GoverningLome IV Development Co-operation Projects. User's Guide*.

Erickson, P.A. (1994) *A Practical Guide to Environmental Impact Assessment*. Academic Press Ltd. London, UK.

Environmental Resources Management (1993). *Environmental Impact Assessment: A Practical Handbook*. Commonwealth Secretariat, London. (171 pp)

FINNIDA (1989). *Guidelines for Environmental Impact Assessment in Development Assistance*. Finnish International Development Agency, Halsinki. (Looseleaf)

Glasson, J., Therival R. and Chadwick, A. (1994) *Introduction to Environmental Impact Assessment*. UCL Press Ltd. University College London, UK.

Hildebrand, S.G. and Cannon, J.B. (eds) (1993) *Environmental Analysis - the NEPA Perspective*. Lewis Publishers. London.

Jain, R K., Urban, L V., Stacey, G.S., and Balbach, H.E. (1993) *Environmental Assessment*. McGraw-Hill, New York, USA.

JICA (1992) *Environmental Guidelines for Infrastructure Projects*. Japanese International Co-operation Agency, Tokyo. (533 pp).

NORAD (1988). *Check Lists for Initial Screening of Projects. Environmental Impact Assessment (EIA) of Development Aid Projects.* Norwegian Agency for Development Cooperation, Oslo. (29 pp)

ODA (1992). *Manual of Environmental Appraisal (Second Edition).* UK Overseas Development Administration, London. (iv, 146 pp)

OECD (1992). *Good Practices for Environmental Impact Assessment of Development Projects.* OECD Development Assistance Committee Guidelines on Environment and Aid No. 1. Organisation for Economic Co-operation and Development, Paris. (17 pp)

Roe, D., Dalal-Clayton, B. and Hughes, R.. (1995) *A Directory of Impact Assessment Guidelines*, IIED, London.

Sadar, M.H. and Associates (1995) *Environmental Impact Assessment*, Carleton University Press, Ottawa, Canada.

Smith, L.G. (1993) *Impact Assessment and Sustainable Resource Management.* Longman Scientific and Technical. Essex. UK.

Therival, R., Wilson, E., Thompson, S., and Heaney, D. (1992), *Strategic Environmental Assessment.* Earthscan. London, UK.

Vanclay, F. and Bronstein, D.A. (eds) (1995) *Environmental and Social Impact Assessment.* John Wiley and Sons. New York. USA.

Wathern, P. (ed) (1988) *Environmental Impact Assessment: Theory and Practice.* Unwin Hyman. London, UK.

Wood, C. (1995) *Environmental Impact Assessment - A Comparative Review.* Longman, Malaysia.

World Bank (1991). *Environmental Assessment Sourcebook, Vols I, II, III.* World Bank, Washington D.C.

Vol I - *Policies, Procedures and Cross-sectoral Issues*
Vol II - *Sectoral Guidelines*
Vol III - *Guidelines for Environmental Assessment of Energy and Industry Projects*

Introduction

For training to be effective it needs to be designed to suit the specific needs of the region or organization as well as those of the people who are attending the training session or course.

This training needs analysis will assist the trainer/course designer in identifying training for capacity building. Parts of it will still be useful if specific training needs have already been identified by some other process.

The training needs analysis establishes:

- *the type of training required*
- *who needs to be trained*
- *the level of training needed.*

It also examines the influence that the broader societal setting (political, institutional, social, bio-physical etc) may have on the design and delivery of EIA training.

While the training needs analysis is best carried out as a group process, most of the activities listed can also be undertaken by the trainer/course designer using telephone, mail or personal contacts.

Structure of the training needs analysis

The approach taken to analyzing the training needs in this manual requires a minimum of expertise on the part of the trainer/course designer.

The training needs analysis is divided into:

Part 1 background research and the collection of background information and materials that describe the country's past experience and proposed directions with EIA.

Part 2 a one to two-day training needs workshop where stakeholders analyze and focus the training needs.

Participant pre-course questionnaire to be used to identify the individual expectations, skills and backgrounds of those attending a training course.

The full training needs workshop (Part 2) is more likely to be used in the development of a comprehensive, country or region-wide training programme. Before holding such a workshop, the trainer/course designer needs to collect information about the EIA system and experience in the country and discuss the potential training needs with a wide range of people involved in the EIA process. Part 1 can be used as a guide to the types of information that might be useful for supporting the workshop as well as used later in the course design.

To complete a full training needs analysis using the workshop approach requires at least two to three weeks of planning, activities, analysis and review. In some cases, such as when defining the training needs nation-wide, this could take even longer.

The participant pre-course questionnaire can be used immediately before each course is run to help identify any specific training needs of course participants.

Who needs to be trained?

Anyone with an interest in EIA can benefit from training in the process. However it has been found through past experience that some groups of stakeholders in the process more frequently require training, or stand to gain the most benefit from training. These groups are:

EIA practitioners — the project managers, planners and environmental specialists who undertake the impact analyzes;

EIA administrators — those who administer the EIA process and review EIA reports; and

Decision-makers — to sensitise them to the benefits of EIA.

Other groups such as development planners, those involved in specialist areas such as social impact analysts, economic analysts, potentially affected communities, educators, proponents, local administrators and the public may also require training, but not usually in as much detail as the above groups.

Part 1 Gathering information about the EIA system and experience

Using the first section of the training needs analysis the trainer/course designer collects information related to the EIA procedures and experience to date in the country in which the training is to take place. Even where there has been no national EIA process and EIA has been carried out using the processes of donor agencies, it is still worthwhile using this information-gathering exercise. The information will provide a valuable understanding of current conditions for training and insights that can usefully be passed to course participants.

This part of the training needs analysis contains a checklist of information to collect and questions to be answered, and a table which, when completed, will give a sample of typical EIAs. Some of this information may already be known by the trainer; the rest can be sought from government officials, practitioners, NGOs, academics, professional societies, published literature etc.

The information collected can be used as the foundation of the training needs workshop described in Part 2 of this Section.

Gathering information to describe the EIA system and experience

Use the following points as a checklist of information that may be useful in obtaining a general overview of the EIA system and experience.

Obtain EIA legislation, guidelines, and policies such as:

- ☐ copies of any relevant EIA legislation, guidelines or policies
- ☐ a simple flowchart of the EIA process that identifies the key components

Summarize the history and evolution of EIA by establishing:

- ☐ the date of the first EIA
- ☐ dates for the introduction of EIA legislation, guidelines or policies
- ☐ the roles that multi-nationals, lending agencies etc have played in EIA to date
- ☐ who has been primarily responsible for the preparation of EIA reports (see proforma on page 20)
- ☐ legislation, guidelines, regulations or policies under which have been prepared
- ☐ the distribution of EIA experience across development sectors
- ☐ whether EIA is commonly used, and under what circumstances

Characterize the EIA policy by:

- ☐ determining the main principles of any EIA legislation, guidelines or policies
- ☐ determining the main features/provisions/requirements of the EIA process
- ☐ identifying any administrative arrangements/procedures for EIA within or between jurisdictions (transboundary)
- ☐ identifying any resource/development policies or strategies (such as National Sustainable Development Strategies, green plans etc) and their relevance to EIA
- ☐ determining the directions in which the processes and practices of EIA are developing

Outline the lessons learned from EIA practice by:

- ☐ determining the quality of EIA reports, and their strengths and weaknesses
- ☐ finding out whether EIA commences early in the design of the project
- ☐ discovering what EIA methods, such as checklists, matrices etc, are used

☐ identifying the nature and level of public participation

☐ determining the level of the benefits and costs of public participation

☐ determining the acceptance/recognition of the benefits of EIA by decision-makers

☐ identifying the extent of designed avoidance, mitigation and compensation of impacts

☐ determining the level of impact monitoring and management

☐ establishing the position concerning interagency cooperation and communication

☐ identifying the strengths and weaknesses of statutory or other bases for EIA

Evaluate the EIA system by finding out whether:

☐ screening for actions with significant impacts takes place

☐ the EIA system is based on clear and specific legal provisions

☐ the relevant environmental impacts of all significant actions must be assessed

☐ there is evidence of the consideration, by the proponent, of the environmental impacts of reasonable alternative actions

☐ scoping of the environmental impacts of actions must take place and specific guidelines must be produced

☐ the mitigation of impacts is considered for the various stages of the EIA process

☐ EIA reports must meet prescribed content requirements and checks are done to prevent the release of inadequate EIA reports

☐ EIA reports are publicly reviewed and the proponent responds to the points raised

☐ the findings of an EIA report and the review are a central determinant of the decision on the action

☐ plans are produced to ensure that mitigation and monitoring are carried out

☐ monitoring of impacts is undertaken

☐ public involvement takes place prior to, and following, EIA report publication.

☐ the financial costs and time requirements of the EIA system are acceptable to those involved and are believed to be outweighed by discernible environmental benefits

☐ the EIA system applies to significant programmes, plans and policies, as well as to projects

Developed from: Wood C.M. (1995)

Gathering information to describe the EIA system and experience

Principal EIAs in the last ten years

Project (and donor if any)	Proponent and group preparing EIA	Year

Part 2 Analyzing the training needs — the training needs workshop

This workshop brings together a range of stakeholders in the EIA process and provides them with the opportunity to discuss a series of topics focused on different aspects of the country setting. The outcomes of these discussions are:

- a series of training needs summaries for a number of target groups (in table form); and
- feedback for the trainer/course designer about possible influences that the societal setting in the country could have on the training being developed.

The success of EIA training depends upon the skills of those designing and presenting the courses. They need a knowledge of the country's EIA processes and experience together with an understanding of the key characteristics of the societal setting.

This part of the training needs analysis describes a one to two-day training needs stakeholder workshop that can be used to:

- identify the groups requiring EIA training, their backgrounds and the nature of their specific needs; and
- establish what influence the political, social and environmental situation will have on the training that is being developed.

A training needs workshop may not always be necessary. In some cases training needs may have already been identified. In others, there is neither the time nor the money available for such detailed analysis. However, if the information necessary to design an effective training course is not compiled in this way, other ways should be found to identify and record it.

The following sections describe how a workshop can be established.

Setting up a training needs workshop

Selecting participants

Workshop representatives could include people from the following groups:

- administrators (from a variety of fields such as environment; planning; infrastructure development; economic and social policy; health; mining, energy and natural resource management)
- politicians
- proponents
- EIA practitioners

- representatives of non-government organizations (NGOs)
- special groups such as indigenous people, women
- aid agencies
- academics
- lawyers, engineers, health and other professionals
- trainers and training organizations
- media
- the general public

The choice of appropriate participants is crucial to the success of the workshop. At a local level it may be helpful to have members of the community identify people who have knowledge of the EIA process and a commitment to it. It is equally important to have a good cross-section of participants active in the EIA process or related areas. Where possible, some senior decision-makers should be included. If the training needs analysis is focused on a region or sector rather than nationally then a modified list of participants may be appropriate.

A national level workshop may have between 12 and 20 participants. At this level there is probably a need for an experienced facilitator to manage the process. At the local level, a much less structured meeting could still be very valuable, covering the same ground and pooling the knowledge of available representatives.

Whatever the level of the meeting the objective is still the same: to identify the training needs within the field of impact assessment and to record the implications that the social, political, economic and cultural influences could have upon the planning and implementation of the EIA training courses.

Designing a workshop programme

A sample of a workshop programme can be found on the next page with programme guidelines for the trainer being outlined on the following pages. This programme can be adapted as required to suit the local needs.

Timing and funding

Make sure there is sufficient lead time to make arrangements, identify, invite and confirm participants, brief participants and produce workshop materials. This could take a few weeks. If funding needs to be sought then the time required will probably be longer.

Choosing a workshop location

The workshop should be held in a location away from workplaces. The venue must be flexible enough to accommodate the whole group comfortably as well as accommodate small working groups.

Evaluation

An evaluation of the workshop should be held during and at the end of the proceedings (see Section 3 *Course design, delivery and evaluation* for details of evaluation techniques).

Capacity building

The workshop should also be viewed as a capacity building exercise. Make sure that all the participants are provided with copies of final summaries and contact details for the other participants. Preferably, these should be supplied at the end of the workshop rather than sent out later.

Sample programme for a two-day training needs workshop

Day One — Morning

- Registration
- Introduction
- **Introduction to EIA and the need for training**
- **Describing the EIA system and experience**

  Objective:
  To confirm the background information about the EIA process collected by the trainer in Part 1 of the Training Needs Analysis (EIA history, policy, lessons learned from practice, principal EIAs, flowchart of the EIA process) is correct and complete.

Day One — Afternoon

- **Analyzing the societal setting**

  Objective:
  Group based discussion of the country's political, social and environmental situation and its relevance to the development and presentation of the EIA training.
- **Consolidation of work done on Day One**

Day Two — Morning

- **Analyzing the societal setting cont'd**

Day Two — Afternoon

- **Defining the training needs**

  Objective:
  To develop a training needs summary that incorporates the group's recommendations for priority training needs.
- **Evaluation of workshop**
- **Closing function**

Training needs workshop — sample programme guidelines for trainer

Day One — am

Registration

Introduction

- workshop objectives
- getting to know each other activity that also establishes the experience and expertise of participants
- outline structure of the workshop
- distribute materials
- establish working groups

Introduction to EIA and the need for training

- outline the purpose, principles and process of EIA.
- define terminology.
- discuss why there is a training need and how training can contribute to capacity building.

Describing the EIA system and experience

Objective: *To confirm the background information about the EIA process collected by the trainer in Part 1 of the training needs analysis (EIA history, policy, lessons learned from practice, principal EIAs, flowchart of the EIA process) is correct and complete.*

❏ Participants should break into groups of about five people and review the information obtained by the trainer/course designer in Part 1 of the analysis (gathering information).

❏ Groups should then report back to the whole group.

Day One — pm

Analyzing the societal setting

Objective: *To identify the influence that the country's political, social and environmental situation may have on the development and presentation of any EIA training.*

❏ Outline the group-based discussion approach that is to be used to identify the training needs.

B-1

❏ Hand out the training needs summary form (Form B-1)from the end of this section identifying the type of information that is required in order to design the training course.

❏ Provide all participants with a complete set of discussion sheets. (Forms B-2 to B-8) under the following headings:

B-2—B-8

- training
- society
- law, policies and development approvals
- access to information
- environment
- the EIA process
- stakeholders in the EIA process

- Allocate discussion sheets to specific groups (the number depends on the number of groups) keeping in mind that some issues may require more discussion than others. Groups may also have preferences for particular issues because of their expertise and experience.
- The groups should work through the questions that they have been allocated, focusing their answers on the implications that the issues listed could have for the development and implementation of the training. From this the groups should develop a set of feedback notes which can be given to the trainer designing the course. The points listed on each sheet may or may not be relevant in any given situation; it should be left up to the groups to decide where they will concentrate their discussion.

Evaluation of day one

- Briefly summarize the outcomes of the day.

Day Two — am

Analyzing the societal setting cont'd

- The groups should work through the remaining questions from the discussion sheets that they have been allocated.
- Groups should report their findings to the whole meeting, for open discussion of any issues on which there is not consensus.

Day Two — pm

Defining the training needs

Objective: *To develop a training needs summary that incorporates the group's recommendations for priority training needs.*

- Participants working as a whole group identify the target groups and complete the training needs summary (Form B-1). An example of a completed training needs summary can be found on the next page.

Conclusion of workshop

- Participants should be provided with summaries of the outcomes of the proceedings and contact details for all who attended the workshop.

Closing function

Sample of completed training needs summary for one target group

Description of target group	— *EIA process administrators and reviewers (from certifying agencies), staff of environment department, government advisers*
Training needs	— *skills in screening large numbers of development proposals to decide which ones require further attention* — *skills in reviewing EIAs – whether they have been carried out to an acceptable standard and comply with terms of reference* — *skills in co-ordinating agency input, and in monitoring and reviewing project performance after implementation*
Expected benefits	— *faster and more accurate identification of projects that require/do not require EIA* — *improved reliability and accountability in the review process* — *improved standard of EIAs* — *improved administrative response by the environment department* — *improved environmental quality resulting from better compliance of proponents to EIA report undertakings and conditions imposed for approval*
Areas in which depth of training is required	— *screening and scoping* — *setting of terms of reference* — *reviewing* — *monitoring and auditing*
Skills or pre-requisites required	— *attended the introductory course or have some practical experience in the EIA process*
Targeted level in organization/group	— *middle level officers and government advisers*
Approximate numbers requiring training (annually)	— *(To cater for staff changes over time this should be a minimum of 25% of those involved in the EIA process)*
Estimated course length	— *two weeks*
Suggested course name	— *EIA for Administrators*
Priority of training need	— *high*

The above table contains a hypothetical example of a training needs summary, completed for one target group. In most cases a training needs workshop will identify three or four of these target groups, such as EIA practitioners, administrators and decision-makers, for which such information will need to be sought. A sample of a course developed for the above training needs using this summary can be found on page 47.

Participant pre-course questionnaire

The participant pre-course questionnaire can be used before the running of each course to identify any specific needs of participants and to fine-tune the design and presentation of the course. It can also be used to discover information about the background of the participants. Often participants will be able to contribute to a course by giving a talk about their experience or discussing projects they have worked on.

Ideally the questionnaire should be sent out to participants as soon as they are identified so that it can be completed and returned with their course application. Difficulties with timing or communications may mean that this is not always possible. In this situation there is still value in asking the participants to fill in a questionnaire as they register at the start of the course. If necessary, some changes in emphasis can still be made to course presentation even at this late stage.

This questionnaire can be found in the resource materials at the end of this section (Form B-9).

Training Needs Summary	
Description of target group	
Training needs	
Expected benefits	
Areas in which depth of training is required	
Skills or pre-requisites required	
Targeted level in organization/group	
Approximate numbers requiring training (annually)	
Estimated course length	
Suggested course name	
Priority of training need	

Discussion Sheet — Analysing the societal setting

Training

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Outline:

- the availability and location of existing (or past) training programmes, courses, manuals etc
- the depth of EIA experience of those currently involved in the EIA training
- the purpose of existing training programmes and the target groups they cater for
- the effectiveness of existing training programmes in meeting the needs of participants
- the features of existing (or past) training programmes that were effective in building EIA capacity
- the numbers of people who have participated in existing training programmes
- the costs, funding sources etc. of existing programmes

✍ **Feedback notes for the trainer**

Discussion Sheet — Analysing the societal setting

Society

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Discuss how the following aspects of society influence good EIA practice within the country and the implications that they have for EIA training, eg:

- population density, growth, mortality, health
- quality of life
- access to education
- culture, language, class structure, religion
- level of commitment to democratic principles, common good, individual and collective rights and responsibilities
- degree of development, level of infrastructure
- land tenure/ownership
- institutional, machinery of government, local and regional issues
- legal system
- policy - sectoral and environmental
- political - processes, levels, systems
- financial - level of debt, privatization, restructuring
- development needs

Outline the:

- ways in which members of local communities, minority groups, including indigenous peoples and women, become involved in public issues
- strategies which are appropriate/successful for promoting public involvement in general

✍ **Feedback notes for the trainer**

Discussion Sheet — Analysing the societal setting

Laws, Policies and Development Approvals

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Outline whether there are detailed policies/laws covering the following areas, the extent to which they are used, how they interact with EIA and the implications that they have for EIA training:

- international conventions
- pollution control standards
- capacity to enforce regulatory mechanisms
- water resources
- energy generation and transmission
- waste management
- flora and fauna, endangered species
- natural resource management
- resource allocation
- land management
- land use planning/regional development
- transportation
- level of jurisdictional cooperation and coordination

Discuss:

- the interaction and integration of EIA with other development approvals processes and permitting systems
- the extent to which government departments in all sectors have a mandate to consider environmental issues

✍ **Feedback notes for the trainer**

Discussion Sheet — Analysing the societal setting

Access to Information

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Discuss the types, sources and availability of environmental information, eg:

- local (professional and traditional) knowledge
- mapping — geological, land use, planning, zoning etc.
- EIA reports
- registers of hazardous sites and materials stores
- results of university or other studies
- baseline studies
- data bases
- geographic information systems (GIS)
- State of Environment Reporting
- national conservation strategies, National Environmental Action Plans (NEAPS), National Agenda 21s, UNDP environmental overviews
- private sector information

Identify:

- alternative methods of generating data, rules of thumb etc.
- availability of information which could be incorporated into the EIA training topics, eg EIA reports, case studies, sites which could be visited, speakers, videos, reports etc.

✍ **Feedback notes for the trainer**

Discussion Sheet — Analysing the societal setting

Environment

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Discuss the current and potential major environmental problems/pressures facing the country, for example:

- dams/water/irrigation
- sewerage/storm water/run off
- soil erosion, salinity
- waste management
- energy production/consumption
- urban development
- transportation
- population growth/distribution
- resource use eg. mining, forestry
- industrial growth and planning
- agricultural production/practices
- forests and forestry practices
- flood mitigation
- fisheries management
- communications

Outline the extent to which the following policies, plans or legislation have been developed:

- environmental protection, assessment and management
- national plans, National Environmental Action Plans (NEAPS)
- sustainable development strategies
- national conservation strategies
- State of the Environment Reports
- policies concerning major environmental issues such as greenhouse, ozone layer, land degradation, salinity etc
- strategic/sectoral/regional environmental assessments
- signing of international conventions such as RAMSAR, biodiversity etc.

✍ **Feedback notes for the trainer**

Discussion Sheet — Analysing the societal setting

The EIA Process

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Discuss:

- previous experience in EIA
- availability and level of expertise
- the situations in which EIA has been most successful, and why
- the situations in which EIA has been least successful, and why
- whether EIA expertise is concentrated in any particular regions in the country
- who has the responsibility for financing and managing the EIA process
- any factors that promote good decision-making
- any barriers to good decision-making
- the ways in which EIA recommendations have been used to implement design changes or produce auditable environmental management plans
- mechanisms which could encourage the early incorporation of EIA into the project planning process
- the systems which are in place to ensure that the EIA process is followed
- depth of knowledge of other EIA and environmental management systems

Outline the extent to which the following factors are practised within EIA:

- the provision of a clear description of the proposal
- the use of comprehensive terms of reference
- the use of screening and scoping processes
- consideration of alternatives to, and within, the project
- adequate impact prediction, evaluation of significance
- mitigation and compensation
- imposition of binding conditions
- monitoring and auditing
- public involvement

Feedback notes for the trainer

Discussion Sheet — Analysing the societal setting

Stakeholders in the EIA Process

Discuss and make notes about the points below and then prepare a set of brief feedback notes highlighting any implications that they may have for any EIA training to be developed or information that the trainer may need to collect before presenting a course.

Identify:

- the range and level of relevant professional, educational and technical skills available within the country
- the major stakeholders in the EIA process eg: developers, government, the public, consultants, decision-makers

Discuss:

- the role/influence the stakeholders have over the EIA process
- when and how they become involved in the EIA process
- their accountability in the EIA process
- the barriers to them performing their tasks satisfactorily
- the extent to which each stakeholder has knowledge of the roles of the other stakeholders in the process
- the extent to which they work together cooperatively
- the degree to which information is shared

✍ **Feedback notes for the trainer**

EIA Course Participant Pre-course Questionnaire

Please indicate if your work requires you to participate in the following tasks and how often you would expect to be involved. Where appropriate, please provide comments which further describe your role in the task.

Providing screening advice

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Identification of key stakeholders

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Setting terms of reference for overall study

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Setting terms of reference for individual consultants

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Generating alternatives

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Identification of information needs

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Undertaking specialised technical analysis

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Determining mitigation measures

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

EIA Course Participant Pre-Course Questionnaire

Recommending the preferred alternative

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Preparing a detailed impact management plan

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Establishing monitoring procedures

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Writing part, or all, of an EIA report

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Reviewing an EIA report for compliance or technical adequacy

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Planning a public involvement strategy

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Writing conditions to accompany project approval

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

Providing information to decision-makers

☐ Never ☐ Sometimes ☐ Often ☐ Nearly Always

Comments

EIA Course Participant Pre-course Questionnaire

Please answer the following where applicable

1. *Please describe the type of work that you do using an example if possible.*

2. *What parts of the EIA process do you work with in detail and why?*

3. *Which types of problems do you have to deal with in your role in the EIA process?*

4. *Which types of problems have been the most difficult to deal with?*

5. *In what skills or knowledge do you feel that you most need training?*

6. *Do you feel that you need training in any of the following communication skills?*

☐ written
☐ verbal
☐ holding meetings
☐ mediation/conflict resolution

7. *Have you previously undertaken any specialised training to do your job? Where and when?*

8. *Do you have any other comment or ideas of ways in which EIA training could be improved in your country?*

9. *Please provide the following information:*

Name:	
Position in organization/group:	
Address	
Telephone:	Fax:
E-Mail:	Date:

Making the arrangements for a course

Choosing a venue

While it may not be possible to produce ideal training conditions, courses will be more effective if some or all of the following facilities can be provided:

- rooms, seating and desks catering for large group presentations and small group activities;
- location away from work places;
- adequate lighting, heating/cooling, quietness;
- access to power and power points;
- the provision of, or access to, food and refreshments during breaks;
- communications facilities such as telephone and fax for course leader and participants;
- blackboards and chalk, white boards and markers, overhead transparency sheets and pens;
- a table set aside for the display of reference materials;
- audio-visual equipment (overhead projectors, slide projectors, video players, tape recorders) and any back-up equipment such as bulbs; and
- office equipment (computers and printers, photocopying etc) and any back-up equipment such as discs or paper.

Depending on the length of the course there may be a need for participant accommodation. This needs to be of good quality if the participants are to leave the course happy.

In some cases the location of the venue will be determined by ease of access for possible site visits.

Course dates and timing

Timing of courses is important at a number of different levels and should be planned far enough ahead to take into account the:

- time of year – courses should not clash with holidays, religious festivals, major events, conferences, other training activities or periods when natural events such as floods or rains may make accessibility difficult;
- length of course – the length of the course needs to be appropriate for the target group. For instance, courses designed for senior government officials or Ministers may need to be very short and focused on their immediate interests if they are to attract key people. A prospective EIA manager, however, may be able to undertake a much longer period of training;

- breaks during the presentation of the course – participants need time off to consolidate their learning, to relax, and most importantly to allow them to get to know each other and establish networks that will benefit them in the future.

See the sample training programme in this section (pages 46–50) for an example of how to structure the time to achieve a balance of activities.

Assistance during training

The session outlines for each topic have been designed on the basis that the trainer will seek assistance from local experts who can be involved in the development of relevant learning materials and/or available to lead discussions and take part in training activities. These experts could include:

- local consultants in EIA
- practitioners and other professionals such as planners, economists, sociologists etc
- representatives of professional societies
- environmental /development agency staff
- academics, or
- the course participants

This last group is important as there is often considerable untapped knowledge within the training group itself. One way of finding out about this is to use the questionnaire in Section B which has been specifically designed to identify both the training needs and existing skills and knowledge of course participants.

Pre-course information

An essential part of course preparation is to make sure that the participants know when and where the programme is to be run, and how to get to the training venue. Make sure that the following information is provided well before the course date:

- contact details for the venue;
- any costs to the participants and how these should be paid; and
- what to bring with them.

The training needs questionnaire can also be distributed at this stage if this has not already been done.

It is also helpful if the Participant Handbook can be distributed well before the course.

Designing a training course

Training courses can be built up from the materials provided in the thirteen topics provided in this manual. These topics are ordered to reflect the staging of the EIA process. Not all topics will need to be used for each training course nor is it expected that all the materials within a topic will be used.

The materials provided may not always be appropriate for a particular culture or stage of economic development. Trainers are encouraged to adapt these materials and to develop their own to meet the specific needs of their prospective course participants.

A training course can be designed by:

- *taking the already established priorities for training as highlighted in the training needs summary tables produced in Section B;*
- *selecting topic materials and training activities that are appropriate for the targeted groups;*
- *using the proformas provided at the end of this section (Section C) to plan and document the course design; and*
- *amending and adding to the materials to suit the participants' needs.*

Developing a course outline

The training courses can be developed from the completed training needs summaries and feedback sheets produced during the training needs workshop. Taking the information for one target group at a time, the trainer/course designer can select topics and training activities from Section D of the manual, keeping in mind specific training needs of the group and the depth of training required. A Session Planning Form (Form C1) should also be completed — for an example of this see the completed form on page 46. The table on page 45 shows the general emphasis on each topic that could be expected for three typical target groups — practitioners, administrators and decision-makers.

The choice of training activity depends on the time available and the identified training need. Where the participants are required at the end of the course to demonstrate proficiency to undertake a specific task, the activity chosen should be a practical one, involving the use of relevant materials and skills. Site visits and excursions should be used to reinforce the materials whenever possible.

The cover sheet for each topic suggests the time required to present the session materials but does not include the time required for the training activities, as this will vary depending on the type of activity chosen. Timings are indicative and sessions are likely to be longer when the trainer and group members are able to contribute significant local knowledge.

The trainer/course designer should check that the course length is approximately the same as the time available, making appropriate adjustments.

Do not forget the importance of the opening and closing sessions. If possible use an interesting and significant person to formally commence and conclude the proceedings.

Preparing the course programme

Once the course outline has been completed the programme can be devised. This involves fitting the desired sessions, activities and site visits into an order and logical structure, allowing generous amounts of time for networking during lunch and tea breaks. Usually the times suggested in the topics will require some juggling or adjustment to fit into a suitable schedule.

An example of a course programme that has been developed from the course outline shown on page 46 can be found on pages 47 to 50. A programme such as this should be provided to all course participants. The trainer will of course require much more detailed notes and lists of resources to be able to present the course.

Preparing the course materials

Once the topics and training activities have been selected, the materials required to run the course can be prepared. This is done by:

- reviewing the information checklist for each topic and then collecting the local resources suggested;
- contacting speakers etc. required to support each training activity (don't forget to draw on the experience of course participants);
- adapting the session presentations for each topic to suit the needs of the participants;
- choosing, adapting or adding overheads, handouts and readings; and
- choosing and copying materials to include in the Participant Handbooks.

There are times when the training may be focused on one project. It may be possible to arrange for the course to be held at, or near, the site in question. The training activities can then become practical applications of the EIA process.

Table: General topic emphasis for typical target groups

Topic	Practitioners	Administrators	Decision-makers
1	●	●	●
2	x	x	x
3	x	●	x
4	—	●	—
5	x	●	—
6	●	x	—
7	x	●	—
8	●	x	—
9	x	●	—
10	x	x	x
11	x	●	—
12	●	—	—
13	●	●	●

● contains important information for this group

x contains useful information for this group

— not usually necessary for this group

Session Planning Form - Sample course outline

Training topic	Specific needs and training comments	Session duration (hours)	Selected training activity	Activity duration (hours)	Total duration (hours)
Topic 1	*general coverage*	2	discussion theme no. (1-4)	0.5	2.5
Topic 2	*general coverage*	3	speaker theme no. (2-2)	1.5	4.5
Topic 3	*general coverage*	2	discussion theme no. (3-7)	0.5	2.5
Topic 4	*detailed topic - activity to develop an appropriate screening procedure*	2	group activity no. (4-1) –comparison of screening methods.	3	5
Topic 5	*detailed topic -activity to provide skills in setting terms of reference*	3	group activity no. (5-1) –scoping of proposed development.	3-4	7
Topic 6	*general coverage*	6	group activity no. (6-1) –using a Leopold matrix	4	10
Topic 7	*detailed topic - activity on producing impact management plans*	2	group activity no. (7-2) –producing an impact management plan from an EIA report	2	4
Topic 8	*general coverage*	2	speaker theme no. (8-2)	4	6
Topic 9	*detailed topic - activity to provide skills in reviewing*	3	group activity no. (9-1) –reviewing an EIA report	7	10
Topic 10	*briefly run through*	1	discussion theme no. (10-1)	1	2
Topic 11	*invite speaker who has experience in monitoring of large infrastructure projects*	2	speaker theme no. (11-2)	1	3
Topic 12	*topic not required*	—	—	—	—
Topic 13	*general coverage*	1	no activity	—	1
Site visits and other excursions — visit three development sites adjacent to Ramsar designated wetlands — Petrochemical plant — Albinger Dam construction site (mitigation and monitoring)					10
Approximate total					67.5

EIA For Administrators —sample course programme

Sunday September 15th

am/pm	• Arrival of participants, met by Dr Ong and Dr Lau • Informal briefing, registration, initial orientation, provision of any outstanding course documentation • Balance of day free.

Monday September 16th

8.30	• Welcome by Chairman of the EPA: Mrs A Chen • Chief trainer Dr Ong outlines course objectives and arrangements
9.30 - 12.00	**Session One—Introduction and Overview of EIA** • sustainable development • environmental problems • EIA history, key steps in the process • costs and benefits of EIA • ethics (Morning tea about 10.30-10.45)
12.00 - 14.00	Lunch
14.00 - 17.00	**Session Two—Law, Policy and Institutional Arrangements** • establishing/modifying effective EIA procedures • critical and emerging issues in EIA • 'rules of thumb' for effective EIA (Afternoon tea about 3.30-3.45)

Tuesday September 17th

9.00 - 10.30	**Session Two continued** • Speaker: 'Successful implementation of EIA procedures in the country of Reman.' Dr F.P Tang
10.30 - 10.45	Morning tea
10.45 - 12.00	**Session Three—Public Involvement** • the role of public involvement in the EIA process • the objectives of public involvement • techniques and methods • effective public involvement • methods of dispute resolution
12.00 - 14.00	Lunch
14.00 - 15.30	**Session Three continued**

15.30 - 15.45	Afternoon tea
15.45 - 17.00	**Session Four—Screening** • when is EIA required? • significance • methods of screening • outcomes from screening
17.00 - 19.00	**Evening:** Reception at the National Art Gallery

Wednesday September 18th

9.00 - 12.00	**Session Four continued** • Group exercise: Comparison of screening methods.
	(Morning tea available from 10.30)
12.00 - 14.00	Lunch
14.00 - 18.00	**Site visit** • To three proposed development sites within the vicinity of the Golden Bay Ramsar designated wetlands. Visit hosted by Mr Chiew, Regional Manager, Department for Environmental Assessment

Thursday September 19th

9.00 - 12.00	**Session Five—Scoping** • the purpose of scoping • managing the scoping process • investigating alternatives • preparing terms of reference
	(Morning tea about 10.30 - 10.45)
12.00 - 14.00	Lunch
14.00 - 17.00	**Session Five continued** • Group exercise: Scoping a proposed development.
	(Afternoon tea available from 3.30)

Friday September 20th

9.00 - 12.00	**Session Six—Assessing: Impact Identification** • the nature and variety of impacts • impact identification methods • Group activity: Using a Leopold matrix.
12.00 - 14.00	Lunch
14.00 - 17.00	**Session Six continued** • Group activity continued

Saturday September 21st

	• Free day

Sunday September 22nd

8.00 - 17.30	• Visit to the Rocky Hills National Park and Wildlife Conservation Zone. (Lunch provided in the Board Room between 12.00 and 14.00.)

Monday September 23rd

9.00 - 10.30	**Session Seven—Assessing** • introduction to analytical techniques • impact characteristics
10.30 - 10.45	Morning tea
10.45 -13.15	**Session Seven continued** • significance testing • significance and the decision-maker
1.35 - 14.30	Lunch
14.30 - 17.00	**Session Eight—Mitigation and Impact Management** • methods of mitigation • producing mitigation management plans • techniques to promote mitigation compliance

Tuesday September 24th

9.00 - 12.00	**Session Eight continued** • Group activity: Producing a mitigation plan from an EIA report (Morning tea available from 10.30)
12.00	Lunch
14.00 - 15.00	**Session Eight continued** • Group activity continued.
15.00 - 15.15	Afternoon tea
15.15 - 17.15	**Session Nine: Writing EIA Reports** • structure and content • common findings • guidelines for production

Wednesday September 25th

9.00 - 12.00	**Site Visit** • Oil and Gas LKS, storage and distribution facility, tour guide Ms Jones, Director of Risk Management

12.00 - 13.00	• Lunch courtesy of Oil and Gas LKS. Address by manager Mr F Choi
13.00 - 17.30	**Site visit** • **Albinger Dam,** construction site, inspection of mitigation monitoring techniques

Thursday September 26th

9.00 - 12.00	**Session Ten: Reviewing EIA Reports** • role of reviewing • the review process • remedial options
12.00 - 14.00	Lunch
14.00 - 18.00	**Session Ten continued** • Group activity: Reviewing an EIA report. (Afternoon tea available from 15.30)
19.00 - 21.00	**Dinner** Royal Botanical Gardens, guest speaker Mrs B Lim, author and media personality.

Friday September 27th

9.00 - 12.00	**Session Ten continued**
12.00 - 13.00	Lunch
13.00 - 17.00	**Session Eleven: Monitoring, Implementing and Auditing** • planning systematic follow-up • environmental monitoring • environmental auditing • implementing a monitoring programme • Speaker: 'Planning, Implementing and Reviewing Monitoring Plans for Ports and Harbour Development.' Dr P Raulins.
17.00 - 19.00	**Closing function and presentation of participation certificates:** • Professor A Lew, Dean of Environmental Science and Management, followed by drinks in the Professorial Dining Suite

Saturday September 28th

11.00	• Departure of participants by bus to airport.
12.00	• Departure of participants leaving on post training tour.

Presenting the training course

The materials in the manual are designed to add variety to presentations and to cater for different learning styles. The presentation of the sessions can be adjusted to suit the trainer's style as well as the learning needs of the participants.

In most cases the trainer should visit the area where the training is to take place well beforehand to note any physical constraints to the presentation (eg. no electricity) and to seek out advice on presentation from local teachers.

Making the presentations interesting

The attention span for listening to a lecture is about ten minutes. If people are going to pay attention for longer than this the style of presentation needs to be varied and the lecture interspersed with approaches such as questioning and discussions that actively involve the participants. Remember that participative activities reinforce learning. Courses can be made more interesting and relevant through the use of:

- activities such as exercises, role plays, games, reports, debates
- case studies
- demonstration of, and opportunity to use, computer applications
- assignment/project work
- site visits/excursions

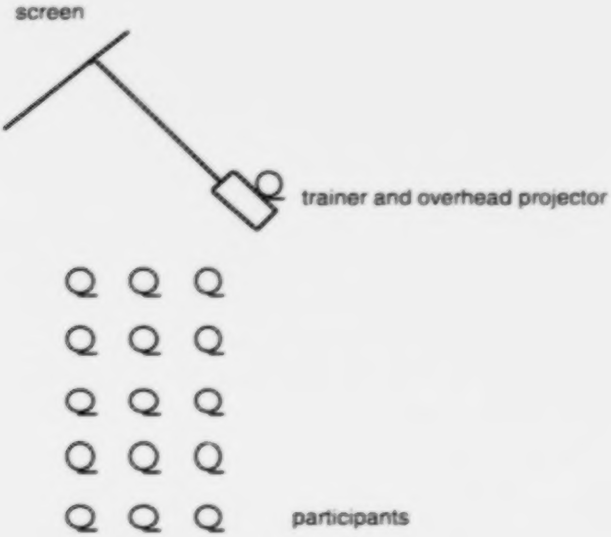
Trainers need to take account of differences in individual learning styles, and any cultural issues which may make course members less eager to participate in group activities. It is important that participants are mentally prepared in advance for interactive activities. They should know the issues to be covered and the work they will do. Sometimes a warm up 'get to know you' exercise might be needed. The style of presentation and activities need to be tailored to the learning needs of individuals as well as to group needs.

Using the overhead projector

The session plans are supported by a number of basic overhead transparencies. These are useful aids during session preparation, and good resource materials for later study if copied and distributed as part of the Participant Handbook. Often it will also be necessary for the trainer to make additional overheads. The information presented on each one should be summarized and kept to a maximum of about eight lines with six or so words per line. The lettering should be large. Each overhead should take three to five minutes to present — any faster than this will leave the participants exhausted and they will quickly lose interest. Where an overhead projector is not available, the trainer can write up the materials on a blackboard, and supply copies of the overhead projector sheets to course participants.

The diagram below shows the preferred arrangement for the use of an overhead projector in a classroom. There are some sensible precautions to be taken to ensure trouble-free presentation of overheads:

- where possible carry a range of spare globes, power outlet adaptors and screwdrivers;
- practise beforehand and make sure you know where the on/off switch is and how to focus the projector;
- set up the overhead projector so that you can stand or sit to one side (show this to the venue organizer beforehand); and
- vary the presentation by switching off the overhead projector between transparencies.



Preferred set-up for overhead projector and screen

Beginning the training

Before the training course begins, make sure that all of the facilities and equipment are ready and that the training and resource materials are at hand. Start formal training sessions with an introductory activity to 'break the ice' and help the participants to get to know each other.

Outline the structure of the course and go through the contents of the Participant Handbook so that the participants are aware of what notes have been provided (this will avoid unnecessary note taking and copying of transparencies).

Remember to:

- involve the participants in the sessions;
- relate the presentation to familiar situations using case studies, site visits etc ;
- check that participants understand the information being presented; and
- vary the presentation style and pace to keep the group's interest.

Managing the group training activities

In planning for the group activities the trainer will need to decide how the participants are going to be formed into small groups. The easiest solution may appear to be to allow participants to form their own groups. However, this often means that people who know each other will choose to work together and miss the opportunity of working with new people and being exposed to different ideas and experiences. It can also mean that one group forms out of all the 'loners' and may not function successfully because of this.

On occasions, there can be genuine personality conflicts within small groups. These can be handled by altering the membership of the groups. However, it should be noted that this type of situation often occurs in real-life EIA and that it may be better to use the opportunity to develop 'coping' strategies and mediation techniques.

The trainer should not become a member of a group during small group activities. The role of the trainer in group activities is to make sure that the groups successfully carry out the required tasks and to:

- ensure that group members understand the purpose of the activity and their role in it;
- answer their questions;
- supply information;
- facilitate the equitable participation of all of the group members;
- sort out any conflicts within the group;
- encourage positive group behaviour;
- move the group along if it is having difficulties with the proposed task; and
- ensure that time schedules are kept.

All small group activities should be concluded by some type of general discussion or reporting session bringing the whole group together.

Where there is sufficient time available, it is often valuable to ask for written individual reports after group sessions to encourage contributions from less vocal group members and to counter the problem of group decision-making.

Supporting the training materials with case studies

Case studies are used to enhance the participants' understanding of *'why'* and *'how'* particular situations were managed and what effect this had on the outcomes. Case studies can include accounts of experiences in local EIAs and can include some of the support materials generated through the EIA process.

It can often be difficult for trainers to obtain well documented local materials. Locally produced studies don't have to be long and detailed to be effective. Short, focused local studies can often be of more immediate value than a more extensive study from an area not familiar to the participants.

Case studies are most likely to be successful if they have relevance to the training course participants, who should be able to identify with the situation being described.

Case study materials are being produced for developing countries by the International Study of the Effectiveness of Environmental Assessment and can be accessed through the Australian EPA Network at the addresses given in the front of the manual.

Case studies can be used for a number of purposes including:

- creating a basis for the course participants to analyse how they might have reacted in a given situation;
- providing examples of practice, and comparison between different practices; and
- analysing examples of practice with the aim of developing improved techniques for future use.

Suitable case studies can also be developed by contacting people who are active in EIA in the region. These could include researchers in educational institutions, NGOs and public interest groups. Ideas for case studies are also likely to be found in the media.

A detailed case study can be used as the basis of the course, illustrating a number of facets of the EIA process and providing the background theme running through a number of sessions.

The following section based on Leaflet 9 of the EIA Centre, Manchester, Leaflet Series, provides an outline of how a case study can be prepared.

Preparing training case studies on environmental impact assessment

(Adapted from Leaflet 9 of the EIA Centre Manchester, Leaflet Series)

This guide is intended to aid those wishing to prepare a case study for use in EIA training. The case study may be prepared for the trainer's own use or for publication and use by other trainers. This guide mainly concentrates on the latter use.

The general principles to be followed in the preparation of such a case study may be summarized as:

- choosing an interesting and appropriate subject
- defining clear training objectives
- providing an overview for other trainers using the case study
- preparing case study information for trainee use
- establishing a realistic timetable for carrying out the case study
- selecting appropriate group sizes
- providing clear instructions to trainers
- setting clear tasks for trainees
- placing the case study in context
- organizing the written presentation of the case study
- testing the case study before it is finalised

This guide is arranged according to these topics. It is supplemented by a short list of references providing additional information.

Choosing a subject

The subject of the case study should depend on the author's experience, the interests of the trainees, the relevance to the region concerned and the availability of information. The choice of subject for a case study depends upon such matters as the training objectives it is intended to serve, the interests and experience of both the trainers and trainees who are expected to use the case study and the availability of relevant information. Ideally, the case study should be based upon a real-world situation by, for example, drawing information from a recent EIA report. Thus it might relate to such projects as oil refineries and petrochemical complexes, highways, water impoundment schemes, railways, deep mines, opencast mining or quarrying, irrigation schemes, housing, waste disposal, oil and gas exploration, etc. Providing information is available, or can be simulated, a case study on almost any subject can be prepared.

Defining training objectives

Clear objectives need to be established before preparing the case study. These will need to take account of the trainees' likely background, knowledge of environmental assessment, their experience, the homogeneity of the trainee group, the aims of the course and the trainer's capabilities. If trainees are likely to be inexperienced there may be considerable advantage in basing the case study on a site selection exercise which involves an examination and comparison of a range of environmental impacts associated with the project being at different locations. If trainees are all from the same background, the objectives may focus upon the specialist tasks relevant to their actual role in the EIA process. If the case study is part of a course designed to provide simulation of a lengthy assessment process, the case study may need to reflect this by, for example, incorporating some field work into its activities.

Providing an overview

If the case study is intended to be used by other trainers, the documentation should include a section which describes the objectives of the case study, the methods of training it entails and the material it uses, so that the trainers can familiarize themselves rapidly with the case study.

Presenting appropriate EIA information

Case study materials can be prepared most easily where the basic information is available in the form of a published EIA report (environmental statement). This will need to be edited carefully to meet the case study's requirements, but often it is appropriate to reproduce sections of the report for certain parts of the case study. For some other parts it may be possible to simulate the information required without using real-life data. (Such data may be unavailable where there have been, as yet, no published examples of EIA reports on the subject concerned.) The phased provision of sufficient, carefully selected information to complete the task in hand, without overwhelming trainees, is an essential feature of a successful case study.

Establishing a realistic timetable

Establishing a realistic timetable is an important requirement for the completion of each of the trainee activities within the case study documentation. While some pressure to work quickly is acceptable and often reflects the reality of professional life, there obviously must be sufficient time available to undertake the tasks to an acceptable standard. Equally, the pace should not be too slow, or trainees will become bored. The testing of the case study on a pilot basis will help to assess whether the timetable is realistic in practice.

Selecting appropriate group sizes

Group working, and learning from others in the group, are essential features of EIA training case studies (which can, however, be modified for personal use). In general, activities based on case studies should be structured for group sizes of between 6 and 10. Smaller sub-groups can be provided for particular tasks if necessary. Again, this is an aspect which can be refined by testing the case study before it is finalised. The use of plenary sessions to compare and discuss the findings of the groups is frequently valuable.

Providing clear instructions for trainers

While trainers can be expected to modify any case study to suit their own purposes, it is essential that, if they are using a case study prepared by someone else, the documentation is clear about what is expected of the trainer, and when and how they should participate in the training process. Details about rooms, equipment, group sizes, timings of sessions, and the distribution of case study material should also be clearly documented.

Setting tasks for trainees

It is preferable that the tasks for trainees are written down and distributed separately from other materials. Each trainee should be clear about what is expected of him or her in relation to each task to be undertaken. These tasks would vary in nature and could, for example, relate to: selecting an appropriate site; determining whether a particular environmental impact assessment should be carried out; determining the scope of the assessment; provision of relevant information by consultees; reviewing an EIA report; and making a recommendation concerning the approval of a project. It is useful if trainees raise questions about the tasks to be undertaken before they start and the instructions to trainers should mention this. The pilot testing of case studies should be used to reveal any inadequacies in the wording of the trainee tasks.

Placing the case study in context

If the case study relates to a decision which has been taken, then the actual outcome should, at an appropriate point, be revealed to the trainees, and this information should be provided in the trainer's documentation. Any relevant comments about the provision of additional information during the actual decision-making process, and the use made of the EIA report in reaching the decision, and about subsequent implementation, should be furnished by the trainer at the end of the group work.

Organizing the structure of the case study documentation

A typical EIA training case study might have the following structure:

- introduction for trainers (objectives, over-view);
- background information and context (general data about the case study);
- case study information (site specific data—generally derived from an EIA report);
- instructions to trainers on interventions, running the groups);
- tasks for trainees (clearly specified instructions);
- conclusions (putting the case study in context).

Some parts of the case study will be copied to trainees (eg. 'background information and context', 'case study information' and 'trainee tasks') whereas others will not (eg. 'introduction for trainers', 'instructions for trainers' and 'conclusions') and the order in which the material is presented within the documentation needs to be carefully planned. There is a strong argument for loose-leaf case study publication, perhaps with a set of slides or photographs showing the site and the type of development envisaged.

Testing the case study

Asking trainers for their opinion and/or asking trainees for theirs, once a case study has been run, is a useful way of testing its effectiveness. Specific questions about the clarity of instructions, appropriateness of timing and so forth, should be asked so that individual parts of the case study can be improved. Such pilot testing of the case study and its documentation should be carried out before it is finalised by the author.

Additional guidance

Further information relevant to organizing EIA training case studies can be found in the following EIA Centre, Manchester, publications.

Sources and Types of Published Information on EIA, Leaflet 3, EIA Leaflet Series.

Organizing Training Courses on Environmental Impact Assessment, Leaflet 8, EIA Leaflet Series.

Lee, N. (1989) *Environmental Impact Assessment: a Training Guide*, 2nd Edition, Occasional Paper 18, Department of Planning and Landscape, University of Manchester.

Wood, C. M. (ed.) (1989) *Environmental Impact Assessment: Five Training Studies*, 2nd Edition, Occasional Paper 19, Department of Planning and Landscape, University of Manchester.

Wood, C. M. and Gazidellis, V. (1985) *A Guide to Training Materials for Environmental Impact Assessment*, Occasional Paper 14, Department of Planning and Landscape, University of Manchester.

Preparing participant handbooks

A participant handbook can be developed for each training course to provide notes and guidance during the presentation of the course itself as well as to be kept as a resource for future use. It is preferable that the participants' handbooks be distributed before the course commences so that some advance reading can be done. The handbooks can be prepared in loose leaf form (in a binder), as a booklet or even as stapled sheets. Regardless of how the material is presented it needs to be consistent in format. The contents could typically include:

- a registration form;
- a list containing the contact details of all course participants, those administering the course, local agencies and specialist consultants etc;
- an outline of the course and programme timetable;
- arrangements for breaks, excursions etc;
- copies of the reading materials provided with the topic and other readings preferred by the trainer;
- lists of references chosen from the end of each topic or others identified by the trainer;
- copies of relevant overheads, handouts and other resource materials;
- copies of instructions for group training activities with spare pages for notes;
- details of any assessment or requirements for assignment work, study etc; and
- an evaluation sheet.

Evaluation of training

There should be an ongoing evaluation of the training at four levels: activity, topic, course and overall programme. Participant feedback can be used to modify and improve the delivery, content and structure of courses and should be sought at the completion of the course or programme.

The proforma shown on Form C–2 can be used at the end of a course to evaluate its success in meeting the needs of the participants. It can be modified for evaluating topics or activities. Participants also should be followed up after 6 to 12 months to assess the longer term benefits of the course.

Regular evaluation of the training programme as a whole should be carried out to assess its success in fulfilling its role in capacity building.

Session Planning Form

Training topic	Specific needs and training comments	Session duration (hours)	Selected training activity	Activity duration (hours)	Total duration (hours)
Topic 1					
Topic 2					
Topic 3					
Topic 4					
Topic 5					
Topic 6					
Topic 7					
Topic 8					
Topic 9					
Topic 10					
Topic 11					
Topic 12					
Topic 13					
Site visits and other excursions					
Approximate total					

Form C-2

Training Course Evaluation Form

Name of training course:

Dates of training course:

Name of trainer:

Presentation of individual topics

Which topics were the most interesting or useful and which were the least? Could you please make a brief comment explaining your reason.

most interesting	least interesting

Comments:
Are there any topics that you think could be added to, or deleted from, the course?

Impressions of training course as a whole

Tick the circle that best describes your feelings about the training course

poor coverage of subjects ○—○—○—○—○ good coverage of subjects

hard to understand ○—○—○—○—○ easy to understand

too general ○—○—○—○—○ too specific

boring ○—○—○—○—○ interesting

insufficient background information ○—○—○—○—○ too much background information

not informative ○—○—○—○—○ informative

not relevant to my needs ○—○—○—○—○ very relevant to my needs

participant handbook inadequate ○—○—○—○—○ participant handbook very adequate

Form C-2

Training Course Evaluation Form

○—○—○—○—○

training not well organised   training well organised

○—○—○—○—○

trainer had insufficient knowledge of subject   trainer had very good knowledge of subject

Comments:

How could the training course be improved?

Will the participant handbook be useful to you in the future?

What follow up activities or materials would you like to see?

Course administration and facilities

Tick the circle that best describes your feelings about the course administration and facilities.

○—○—○—○—○

poor course administration   good course administration

○—○—○—○—○

poor course facilities   good course facilities

○—○—○—○—○

poor accommodation   good accommodation

○—○—○—○—○

poor meals and refreshments   good meals and refreshments

Comments:

Your professional background:

Your organisation/agency/institution:

Your position/function:

Your first language is:

Topic 1—Introduction and Overview of EIA

Objective

To introduce the concept of EIA within the framework of sustainable development. To outline the history of EIA, why it is needed, the costs and benefits of the process and the role of capacity building.

Relevance

In order to achieve the most from the EIA process it is important that those practising EIA have an understanding of the purpose/objectives of the process and its potential in assisting in the move towards sustainability.

Timing

Two hours (not including training activity)

☑ Information checklist

Obtain or develop the following, as appropriate:

- ☐ examples of environmental problems facing the country/region;
- ☐ a brief history of the use of EIA in the country/region;
- ☐ a flowchart that represents the EIA process in the country/region (if no EIA system is in place look for materials from donor agencies and nearby countries as well as information about any proposed EIA system (draft procedures etc));
- ☐ examples of the benefits gained by any local proposals or programmes that have undergone EIA;
- ☐ examples of EIA capacity building;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres who may be able to provide assistance in relation to environmental impact assessment; and
- ☐ other resources that may be available such as videos, journal articles, computer programmes, lists of speakers, case studies etc.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why these are important.

This topic introduces the concept of EIA placing it within the framework of sustainable development. It outlines the history of EIA, the costs and benefits of the process and the role of capacity building.

Discuss the meaning of sustainable development and the role that EIA can play as a tool in moving towards sustainability.

In 1987 The World Commission on Environment and Development defined sustainable development as development that meets the needs of today's generation without compromising those of future generations.

The environment is the backbone of the economy, the source of livelihoods as well as a source of national wealth. The security of these livelihoods is dependent on the sustainable management and development of a country's resource base[1]. As the pressures of industrialisation, urbanisation and use of the resource base increase there is the need for resources to be managed in a prudent manner. One of the tools for doing this is environmental impact assessment (sometimes called environmental assessment or environmental review).

The purpose of EIA is to ensure that development proposals, activities and programmes are environmentally sound and sustainable. EIA is a planning process used to predict, analyze and intrepret the significant environmental effects of a proposal and to provide information that can be used during decision-making.

EIA can be used to minimise or prevent adverse effects and at the same time help countries to capture the real potential of their resources, maximising the benefits of a proposed development. It is a process that can:

- modify and improve the design of a proposal;
- ensure that resources are used efficiently;
- enhance the social aspects related to the proposal;
- identify measures for monitoring and managing impacts; and
- facilitate informed decision-making.

1

Best practice EIA has an ongoing role during implementation. Then, as projects are constructed and commissioned, or programmes implemented, the environmental consequences can be further minimised by appropriate mitigative and monitoring measures.

This role for environmental impact assessment was formally recognized at the Earth Summit (United Nations Conference on Environment and Development, UNCED) held in Rio in 1992. Rio Principle 17 states:

> Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

Introduce the range of environmental problems facing society. Give specific national examples and invite the participants to give examples from their own experience.

Environmental problems can vary from the direct effects of the pollution of waterways and the air, through to indirect effects such as health problems caused by changes in lifestyle or earthquakes resulting from the construction of large dams. Some environmental problems may appear to be insignificant when considered within an individual proposal but might have adverse consequences if the effects of all such proposals are added together (cumulative effects). Pollution due to automobile use and deforestation resulting from the gathering of firewood for domestic purposes are examples of such cumulative effects. Sometimes the problems may be related to debt or trade or they may involve the sharing of transboundary resources such as the air or ocean. These may not appear to be problems on their own, but in combination with other factors they may be of concern.

In order to manage such large scale environmental problems it is necessary to have an understanding of environmental impacts and the different ways in which they can vary. Impacts can vary in:

2

- type and nature
- magnitude
- extent
- timing
- duration
- uncertainty
- reversibility
- significance

Type and nature

Impacts can vary in type from the biophysical through to the social, health or economic. They may also vary in nature, being direct or indirect, cumulative, synergistic etc.

Magnitude

In terms of their consequences impacts can range from insignificant (no need for remedial action) to highly significant (requiring remediation and monitoring).

Extent

The impacts may have only a local effect such as the need for additional housing or schooling or they may have regional, transboundary or global significance as in discharge of atmospheric pollutants or significant contributions to greenhouse gases.

Timing

The impacts may be felt immediately or may not be evident for some time. For instance, exposure to carcinogenic chemicals or radiation can be responsible for cancers developing 20 or 30 years later.

Duration

The impact may range from short term, such as noise during construction, through to permanent impacts, as found in the relocation of a village due to inundation during dam construction.

Uncertainty

Impacts can vary in both the likelihood and consequences of occurrence; for instance the likelihood of a major oil spill may be low but the consequences of its occurrence are significant.

Reversibility

Some impacts may be reversible, or able to be rehabilitated upon the decommissioning of a project, while others may be irreversible.

Significance

Impact significance is not necessarily related to the impact magnitude. Sometimes very small impacts, such as the disturbance of the nest of a pair of endangered birds, may be very significant, while even very large impacts may not necessarily be very significant.

In determining the significance of the impacts associated with a proposal all of the above factors should be taken into consideration.

Introduce the concept of integrated environmental assessment.[2]

3

In the early years of EIA, environmental impacts were considered to be impacts on the natural, biophysical environment (such as effects on air and water quality, flora and fauna, noise levels, climate and hydrological systems).

The focus on biophysical impacts alone did not last long. The institutionalisation of EIA, with its public disclosure and consultation processes, seemed to act as a magnet to individuals, groups and agencies who wanted other kinds of impacts to be incorporated in decisions. They were assisted to some extent by the changing definition of the term 'environment', the definition of which was increasingly broadened to incorporate other aspects such as social, health and economic.

Since the mid-1970s there has been a growing tendency to use EIA processes as vehicles for analyzing a variety of impact types, within a single framework, to achieve integrated assessment for decision-making. However, there are still some countries where social impacts are not assessed or where the range of social impacts considered in EIA is very limited or where EIAs are supplemented by related, but separate, specific studies (and reports) on social/health impacts. The degree and extent of integration varies, therefore, according to the context of the studies.

Despite a lack of internationally consistent practice, it is possible to identify a majority 'position' which is that integrated assessments, potentially covering a wide range of impacts, are needed and that EIAs are the best available mechanism for implementing them.

Provide a brief history of the origins and purposes of EIA. Include, where possible, an outline of the history of EIA in the country/region.[3]

The combination of exponential population growth, urbanisation, industrialisation and the ability of society to implement proposals that make large scale changes to the landscape, has resulted in unprecedented pressures on the environment.

As early as the fourteenth century people began to try to manage environmental problems through the introduction of pollution regulations. However, the environment was thought of as a 'free good' with a limitless capacity to produce resources and absorb wastes. With the passing of time has come the realisation that this 'limitless' view of the world was incorrect. It was also realised that it is much more effective to prevent problems in the first place than to repair the damage later.

In this century, there has been a growing number of techniques developed to assess the relative costs and benefits of projects to society. These include cost/benefit analysis and multi-objective programming. By the 1950s and 1960s projects in industrialised countries were of such a large scale and number that it became apparent that the existing techniques of project evaluation were inadequate. In the United States in particular, public pressure was exerted on the Government to accept accountability for the activities of its agencies. In response, the National Environmental Policy Act (NEPA) was proclaimed in 1970, establishing a federal environmental policy. Important aspects of the legislation were the preparation of a public statement of the environmentally significant consequences of all federal actions, public input into project formulation and informed decision-making. This process under NEPA became known as environmental impact assessment.

4

Since its introduction, EIA has undergone a remarkable expansion and is now widely used as an approach for development planning and management. The architects of NEPA, when specifying the environmental impact statement as the action-forcing mechanism for implementing legislation, clearly intended to redirect federal policy making and administration. They could not have foreseen the extent to which EIA would become widely used by other countries, culminating two decades later in the Rio Declaration which calls for the universal adoption of EIA. Based on its acceptance and use, environmental impact assessment can be judged as a highly successful policy mechanism. EIA has continued to evolve through innovations in law, procedure and methodology. Several major trends in the development of the process can be identified for those countries that made an early start with EIA; for example, USA (1969), Australia (1973), Canada (1973), New Zealand (1973) and France (1976) (see Box 1). However, it is the overall process and direction of progress in EIA that is important, and particularly notable are recent international developments (see Box 2).

Box 1: Major trends in EIA

5 The evolution of EIA can be divided into four main phases:

i) initial development (early 1970s) — introduction of basic principles, insititutional arrangements and analytical techniques for conducting EIA;

ii) expanding scope (later '70s, early '80s) — progressive inclusion of social, risk, health and related factors, improved opportunities for public participation, greater focus on impact management;

iii) process redirection (mid-late '80's) — increasing efforts to address cumulative effects, to integrate project-level EIA with policy, planning and regulatory frameworks, and to establish monitoring, audit and other follow-up procedures;

iv) toward a sustainability paradigm (to date) — development of strategic environmental assessment (SEA), new requirements for EIA established by international conventions (eg. biodiversity), introduction of consensus-based dispute settlement procedures.

Sadler, 1995

Box 2: International developments in EIA in the 1990s

6 In the last five years, significant international developments in EIA include:

i) major reforms were made or are pending to well-established EIA systems (eg. Australia, New Zealand, Canada);

ii) the European Community Directive on EIA (1985) was widely implemented and has driven domestic reform in UK and other member states;

iii) the World Bank and other development assistance agencies established EIA policies and procedures and introduced the process to many developing countries;

iv) the Espoo Convention (UN Economic Commission for Europe [UNECE] Convention on EIA in a Transboundary Context, 1991) identified principles and provisions for EIA of projects and activities with transboundary effects; and

v) additional requirements were placed on EIA by the UN Conventions on Climate Change and Biological Diversity (1992).

Sadler, 1995

Introduce the key principles of EIA as identified through the International Study of the Effectiveness of Environmental Assessment and discuss these.

While EIA has been primarily practised in industrialised countries as a project-oriented planning tool, the evolving concept of sustainable development has highlighted the need for the role of EIA to be expanded and for other techniques, such as strategic environment assessment, to be developed to complement the procedure. With these types of issues in mind the International Study of the Effectiveness of Environmental Assessment was launched in 1993 as a joint initiative of the Canadian Environmental Assessment Agency and the International Association of Impact Assessment to:

- review recent trends, key issues and emerging directions for environmental assessment;
- examine the contribution of environmental assessment to problem-solving and decision-making;
- identify and document elements of environmental assessment systems that work well; and
- recommend cost-effective measures for improving the application and management of environmental assessment.

One of the outcomes of the two year process of review, consultation and discussion during the International Study has been the identification of a series of core values, guiding principles and operating principles for the practice of EIA.

7

EIA — Three core values

- ***sustainability*** — the EIA process will result in environmental safeguards
- ***integrity*** — the EIA process will conform to agreed standards
- ***utility*** — the EIA process will provide balanced, credible information for decision-making

8

EIA — Eight guiding principles

- ***participation*** — appropriate and timely access to the process for all interested parties
- ***transparency*** — all assessment decisions, and their basis, should be open and accessible
- ***certainty*** — the process and timing of assessment should be agreed in advance and followed by all participants
- ***accountability*** — decision-makers are responsible to all parties for their actions and decisions under the assessment process
- ***credibility*** — assessments are undertaken with professionalism and objectivity
- ***cost-effectiveness*** — the assessment process and its outcomes will ensure environmental protection at the least cost to society
- ***flexibility*** — the assessment process should be able to adapt to deal efficiently and effectively with any proposal or decision-making situation

- ***practicality*** — the information and outputs provided by the assessment process are readily usable in decision-making and planning

EIA — 21 operating principles

9 ***EIA should be applied:***

- to all development project activities likely to cause potentially significant adverse impacts or add to actual or potentially foreseeable cumulative effects
- as a primary instrument for environmental management to ensure that impacts of development are minimised, avoided or rehabilitated
- so that the scope of review is consistent with the nature of the project or activity and commensurate with the likely issues and impacts
- on the basis of well defined roles, rules and responsibilities for key actors

10 ***EIA should be undertaken:***

- throughout the project cycle, beginning as early as possible in the concept design phase
- with clear reference to the requirements for project authorization and follow-up, including impact management
- consistent with the application of 'best practicable' science and mitigation technology
- in accordance with established procedures and project-specific terms of reference, including agreed timelines
- to provide meaningful public consultation with communities, groups and parties directly affected by, or with an interest in, the project and/or its environmental impacts

11 ***EIA should address, wherever necessary or appropriate:***

- all related and relevant factors, including social and health risks and impacts
- cumulative and long-term, large-scale effects
- design, locational and technological alternatives to the proposal being assessed
- sustainability considerations including resource productivity, assimilative capacity and biological diversity

12 ***EIA should result in:***

- accurate and appropriate information as to the nature, likely magnitude and significance of potential effects, risks and consequences of a proposed undertaking and alternatives to it
- the preparation of an impact statement or report that presents this information in a clear, understandable and relevant form for decision-making, including reference to qualifications, confidence limits in the predictions made

- ongoing problem solving and conflict resolution to the extent possible during the application of the process

13

EIA should provide the basis for:

- environmentally sound decision-making in which terms and conditions are clearly specified and enforced
- the design, planning and construction of acceptable development projects that meet environmental standards and resource management objectives
- an appropriate follow-up process with requirements for monitoring, management, audit and evaluation that are based on the significance of potential effects, the uncertainty associated with prediction and mitigation, and the opportunity for making future improvements in project design or process application

---

Introduce the main features of the EIA system, including managing the process and deciding on its application. Provide information about the local process if there is one. Invite participants to share their experience of EIA and discuss any problems they have encountered.

The proponent is usually (but not always) responsible for carrying out an environmental impact assessment. The requirements for the EIA may be set out in law, guidelines or other procedures depending upon the country or donors involved in the project. Sometimes it may be necessary for the proponent to comply with more than one set of procedures. In this case, the need for good planning is even more important.

Most EIA procedures call for the involvement of the public at some, or many, of the stages of the process. While inexperienced proponents are often reluctant to provide information to the public or to seek their opinions, experienced proponents now recognize the long term benefits of incorporating the public from an early stage in formation of a proposal.

Environmental impact assessments are usually carried out by a team of people appointed specifically to the task, with an appropriate range of scientific, economic and social expertise. This group of people act as an interdisciplinary team, meeting together to plan a systematic process for carrying out the study. The team leader (often called the EIA project manager) plays a key role in the successful outcome of the process.

It would be time consuming and a waste of resources for all proposals to undergo EIA. Different EIA systems use different methods of choosing, or screening projects to decide which will not significantly affect the environment and which will. Some systems designate projects or areas using threshold lists. Others use judgement or initial evaluations to determine environmental significance based on proposal type, size, cost, the sensitivity of the environment to development, or the strength of community opinion.

14

The exact components, staging and responsibilities for an EIA process will depend upon the requirements of the country or donor. However, most EIA processes have a similar structure (see flow chart on the next page). The main stages are:

Screening
An initial assessment to decide whether a project requires further investigation in an EIA.

Scoping
To identify the key impacts requiring further investigation, and prepare the terms of reference for the study.

Assessing
The identification, analysis and evaluation of the significance of impacts.

Mitigation
Developing measures to prevent, reduce or compensate for impacts and to make good environmental damage.

Reporting
Presenting the results of the impact assessment in a useful format.

Reviewing
Assessing the adequacy of the EIA report, taking account of the points of view of stakeholders and assessing the acceptability of the proposal in terms of existing plans, policies and standards.

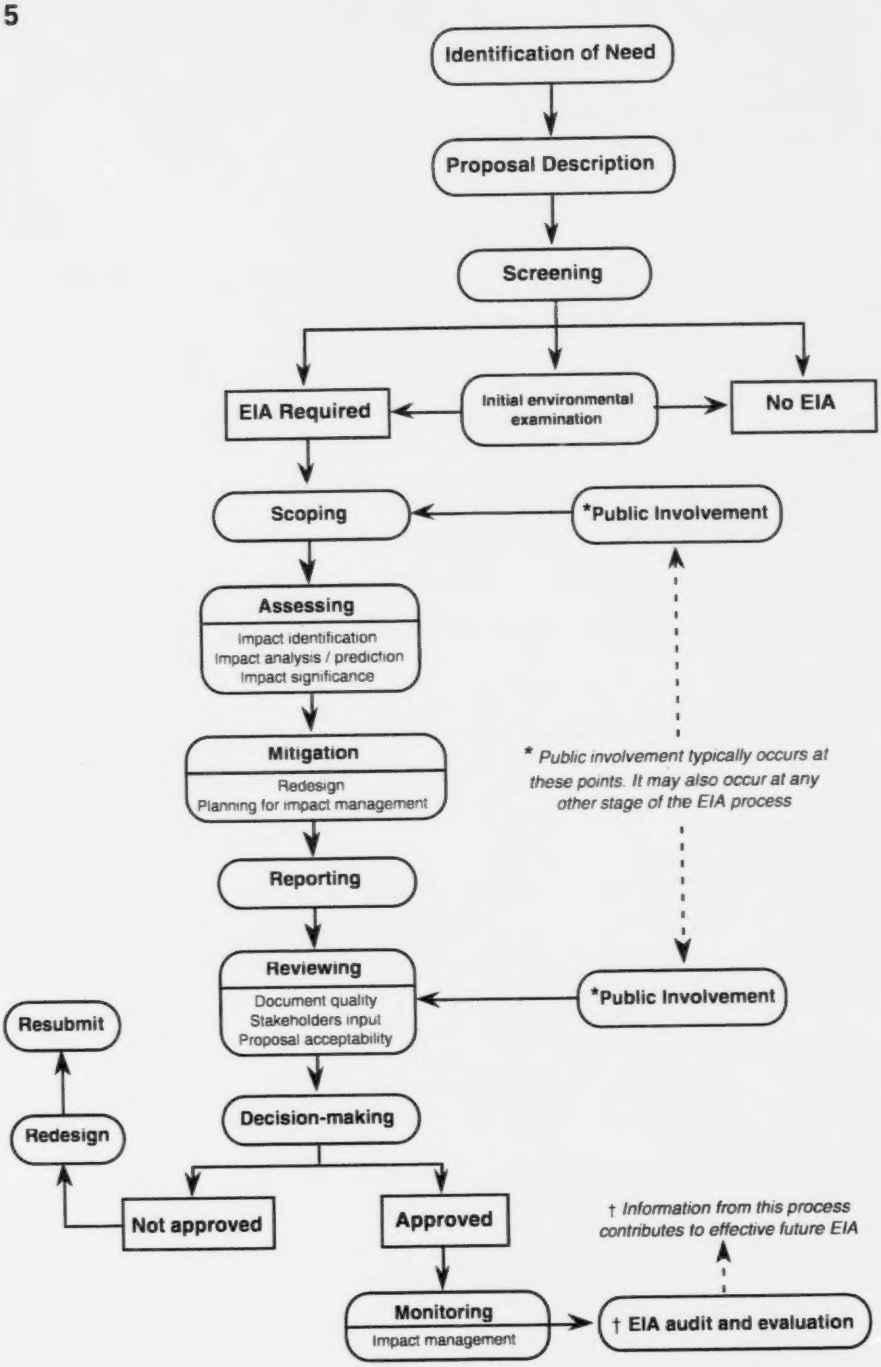
Decision-making
To decide whether the proposal can proceed and under what conditions. The decision-maker has the option to request that the project be redesigned (or aspects of the project redesigned) so that the environmental effects are minimised.

Monitoring and managing
Implementing mitigation measures, monitoring impacts for compliance, checking that they are as predicted. Where necessary taking action to ameliorate problems.

Public involvement
Happens typically during the scoping and reviewing phases of EIA but may also occur at any of the other stages of the EIA process. Public inolvement programmes can range in purpose from those that aim only to provide the public with information, through to those that encourage the full involvement of the public in the decision-making process. Public involvement must be carried out in a manner that is appropriate to the culture of the people concerned.

15

Generalised EIA Process Flowchart


Identification of Need
Proposal Description
Screening
EIA Required
Initial environmental examination
No EIA
Scoping
*Public Involvement
Assessing
Impact identification
Impact analysis / prediction
Impact significance
Mitigation
Redesign
Planning for impact management
Reporting
Reviewing
Document quality
Stakeholders input
Proposal acceptability
*Public Involvement
Resubmit
Redesign
Decision-making
Not approved
Approved
Monitoring
Impact management
† EIA audit and evaluation

** Public involvement typically occurs at these points. It may also occur at any other stage of the EIA process*

† Information from this process contributes to effective future EIA

Discuss the costs and benefits of using an EIA process, and provide local examples that highlight the gains that can be obtained from a well managed EIA.

While there is an initial cost associated with EIA, experience has shown that the potential savings over the life of a project can repay the investment many times over. It has also been seen that the earlier EIA processes are introduced in the project cycle, the greater the potential gain. This is because the proposal can be well designed in the first place rather than having to be modified later.

16

Costs

It can be difficult to determine the exact costs of undertaking an EIA because major projects require a large number of initial investigations even without an EIA. The World Bank[4] notes that the cost of preparing an EIA rarely exceeds one per cent of the project costs and even this relatively low cost can be reduced further if local personnel are used to do most of the work. For instance, an investigation of water resource projects in Thailand found that the costs of EIAs there ranged from only 0.01 per cent to 0.11 per cent of the total project costs. The costs of an EIA might range from a few thousand dollars for a very small project, to over a million dollars for a large and complex project.

17

Although many proponents complain that EIA causes delays in projects, many of these delays are caused by poor administration of the process rather than by the process itself. These occur when:

- the EIA is commenced too late in the project cycle;
- the terms of reference are poorly drafted;.
- the EIA is not managed to a schedule;
- the EIA report is inadequate and needs to be upgraded; and
- there is a lack of technical data.

There is no standard timeframe for the EIA process. Most projects merely require screening and might take only an hour or two's work. For a small irrigation project or building the whole EIA process may take a few days, whereas for a large infrastructure project the EIA process could take anything from six months to two years.

The costs and time involved in EIA decrease once experience is gained with the process and the availability of baseline data is increased.

Benefits

The benefits of EIA can be direct, such as the improved design or siting of a project, or indirect, such as raising the environmental awareness of the personnel involved in the project and the flow-on effect this has in their future work. As mentioned above, the potential gains from EIA increase when EIA processes commence early in the design process.

18

In general the benefits of EIA include:

- *More environmentally sustainable design or improvements in the design and siting of a plant.* Carrying out an EIA entails an analysis of possible alternatives in the design and siting of projects. This results in an overall improvement in the general state of the environment and location of projects. A well designed project can also minimise the risk of project-induced disease and the associated costs of treatment or compensation.
- *Better compliance with environmental standards.* Compliance with environmental standards reduces disruption and damage to the environment and reduces the likelihood of fines and penalties.
- *Savings in capital and operating costs.* Costs can escalate if environmental problems have not been considered at the beginning and require rectification later. This may involve adopting some expensive mitigation measures or reducing the size or output of the project. The chances of expensive late changes can be minimised by carrying out an EIA at the earliest stages of the project cycle.
- *Reduced time and costs of approvals of development applications.* If all environmental concerns have been taken into account before submission for project approval, then it is unlikely that delays will occur.
- *Increased project acceptance by the public.* This is achieved by public involvement throughout the process.

Box 3 outlines the benefits of environmental assessment to business and governments.

Box 3: An important management tool

Business and governments have an important planning and decision-making tool in the pursuit of sustainable development–environmental assessment.

Environmental assessment is a systematic process used to help make decisions that take into account the impacts of human activities on the environment. The process helps factor environmental effects into project proposals, policies and programmes – much the same way as cost, resources and labour are considered.

The process involves an assessment of the potential impacts of a proposed project, policy or programme on the ecosystem – the air, water, land and living organisms. A study of the socio-economic impacts on affected human populations is also included. Such assessments provide a solid basis for limiting or eliminating environmental effects and for making decisions.

By integrating environmental factors, public concerns and community values early in the decision-making process, business and governments can make timely decisions on projects.

Environmental assessment provides a forum to discuss the large and growing public concerns about environment and health. In turn, the process helps business and governments to meet their responsibilities for the environment and to earn public confidence.

The environmental assessment process.

An environmental assessment begins early in the planning stages of a proposed policy, program or project. It is completed before the policy or program is implemented or construction of the project begins.

While the decision-making process itself may vary depending on the country, state or province, region or municipality, environmental assessments generally follow similar steps. (To simplify our description, we will apply the process to projects.)

The process starts with an effort to understand the potential environmental effects of a project. Some of the typical questions raised at this stage include: What is the environmental setting of the proposed project? What natural resources will be needed? What waste will the project produce? Will the project increase the load of toxic substances in the air or water? Will plants, fish and wildlife be affected? Will communities be disturbed? If there are effects, can they be avoided, limited or contained? If so, how and with what actions? What benefits will the project bring to the environment and to the community?

The process may then look at options. Are there alternatives with lesser impacts that would achieve a similar purpose? How do the options compare over time?

Once the options are refined and reviewed in light of public, scientific and other expert input, recommendations are made to the responsible authorities. A decision is then taken on whether to proceed with the project and how, if the project is approved. The recommendations from the environmental assessment process serve as a solid basis for monitoring and follow-up plans.

Environmental assessments—large or small, formal or informal—empower decision-makers to make practical, responsible and informed choices.

Environmental assessment is good planning

Good environmental assessment is good management, and good management is good business.

- **The environmental assessment process promotes better planning.** The scrutiny of a project and its alternatives through environmental assessment leads to a more effective and efficient project.
- **The process saves time and money in the long run.** By integrating environmental factors in decision-making at the planning stage, business and governments avoid expensive and sometimes controversial remedial action afterwards.
- **The process facilitates investment.** Conducting an environmental assessment facilitates the gathering of information now required by financial and other institutions that loan money or make investment decisions for major developments. In addition, the process can help long-term investments by determining how resources can best be managed over the longer term.
- **It keeps business and governments in touch.** Input through public consultation, before plans are finalised and investments made, can improve community relations and ensure dollars are well invested. As a good management practice, environmental assessments can support future prosperity. Through decisions based on recommendations from the process, there can be more prudent use of resources and a reduction of environmental threats to human health and ecosystems.
- **Environmental assessment leads to responsible decisions.** Responsible decisions in turn are good for investment, good for the health of the organization, its employees and the community where it operates. As well, responsible decisions sustain and enhance the value of the environment we pass on to future generations.

What you can do

Environmental assessment is a planning and decision-making tool. By following a few steps any organization can apply environmental assessments to ensure that the best possible decisions are made.

Here are some steps you can take to improve your decisions:

- **Be informed.** Develop a good knowledge base about the environment and the environmental effects of your projects as well as the principles and methods of environmental assessment. Understand the environmental assessment laws and processes that apply to your organization and its operations.
- **Make environmental considerations a priority.** Establish environmental assessment as part of the policies, procedures and day-to-day practice throughout your organization.
- **Assess your decisions, policies and activities for their impact on the environment.** This will strengthen the investment and development decisions by your organization.
- **Establish stronger links with stakeholders — undertake consultations.** Greater communications will build a better understanding of community concerns and keep corporate goals current.
- **Integrate community values and concerns along with scientific and technical information in decision-making.**
- **Monitor and evaluate your projects.** Follow up on your environmental assessments to determine the effectiveness of your predictions or measures taken to reduce environmental effects. Use this information to improve your practice of environmental assessment.

Source: FEARO, 1992

Suggestions for making the EIA process credible and fair

19

It should be recognized that every individual, including intervenors, has some bias. Full public involvement in the EIA process provides a fair counterbalance to this bias and gives decision-makers another perspective of the proposal and the opportunity to make their decision in a fully informed manner.

There are a number of other measures that can also be put into place to ensure the ethical behaviour of those involved in the process. In general these measures rely on making the EIA process transparent, accessible and accountable to the public. Examples of simple measures that could be implemented are:

- requiring the proponent to register all consultants' names and their terms of reference with the administering agency;
- listing all consultants, their expertise and responsibilities in the environmental assessment report;
- publishing the terms of reference in the EIA report;
- making all EIA reports available to the public; and
- publishing lists of decisions – screening and final outcomes – along with any recommendations for mitigation and impact management plans.

Discuss the importance of building local capacity. Point out efforts that support the processes and enable the purposes of EIA to be achieved.

Capacity building is the long-term, voluntary process of increasing the ability of a country to identify and solve its own problems, opportunities and risks. [5]

In this context, countries should be moving towards carrying out as much of their own environmental impact assessment as they are able. Where this is not possible and outside experts are engaged, then the opportunity should be taken to transfer this expertise to local personnel.

Capacity building can be carried out by developing and offering educational and training programmes. It also requires long-term commitment for strengthening education and research institutions. Training can be done at many different levels and over different periods to meet a variety of needs. Long term programmes might be used to train university graduates as EIA practitioners, whereas short term training courses might be used to raise awareness of the process or train people in specific techniques.

A complete capacity building programme will need to provide a range of different activities. These could also include developing a library of environmental assessment reports, maintaining a database of information collected during an EIA or establishing a network of practitioners with experience in EIA or technical analysis.

Include a training activity to reinforce the topic (if desired).

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. UNEP (1994) *An Environmental Impact Assessment Framework for Africa.* Nairobi

2. Bisset, R. (1996) *EIA: Issues, Trends & Practice.* The Environment and Economics Unit UNEP. Nairobi

3. Sadler, B. (1995) *Environment Assessment: Toward Improved Effectiveness of Environmental Assessment. Interim Report and Discussion Paper.* Canada

4. The World Bank (1991) *Environmental Assessment Sourcebook.* Washington. Vol 1

5. OECD (1993) *Capacity Development in Environment.* Costa Rica

6. Boyle, J. and Mubvami, T. (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe.* Department of Natural Resources, Ministry of Environment and Tourism. Zimbabwe

FEARO (1992) *Environment Assessment is Good Business.*

Further reading

Biswas, A. K. and Qu Geping (1987) *Environmental Impact Assessment for Developing Countries.* Tycooly. London

Glasson, J., Therivel, R. and Chadwick, A. (1994) Introduction and Principles. In *Introduction to Environmental Impact Assessment.* ed. Glasson et al. UCL Press. London pp 2-24

Lawrence, D. P. (1994) Designing and Adapting the EIA Planning Process. *The Environmental Professional.* vol. 16. pp 2-21

Rees, W. E. (1988) A Role for Environmental Assessment in Achieving Sustainable Development. *Environmental Impact Assessment Review.* vol. 8 pp 273-291

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment.* CEAA and IAIA. Canada

United Nations Environment Programme (UNEP) (1988) *Environmental Impact Assessment: Basic Procedures for Developing Countries.* UNEP Regional Office for Asia and the Pacific. Bangkok. 16pp

Wandesforde-Smith, G., Carpenter, R. A. and Horberry, J. (1985) EIA in Developing Countries: An Introduction. *Environmental Impact Assessment Review* 5(3). pp 201-206

Wathern, P. (1988) An Introductory Guide to EIA. In *Environmental Impact Assessment: Theory and Practice.* ed. Wathern, P., Unwin Hyman. London. pp 3-30

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

1–1 How can environmental impact assessment be used to promote specific national environmental goals?

1–2 Discuss how the following elements affect the ability to build EIA capacity nationally: [6]

  a. cultural values/social structure, economic system/condition, education, public attitudes, political structure, local control, awareness, natural resource base, institutional/technical capacity, international context, legal framework, media, the status of indigenous people and women.

  b. What could be done in each of these contexts to improve the situation?

1–3 What provisions currently exist nationally for EIA capacity building? What approach would you recommend for improving the ability to build EIA capacity? What support is required for the EIA capacity building?

1–4 Is EIA a process that is suited to smaller projects? How could EIA be adapted in the case of small projects to make it more efficient?

1–5 Are there ethical issues which militate against effective EIA? What is the nature of the problem and what measures could be taken to improve the situation?

Speaker themes

1–1 Invite a speaker who has a broad experience in EIA to give examples of the costs and potential benefits of the EIA process to project development and environmental protection.

1–2 Invite a speaker with a good knowledge of the national experience of EIA to provide a history of the process and a view of the directions in which it is moving.

Group Activity 1-1: Introduction and Overview of EIA

Title	**Building the EIA Process**
Aim	Developing an awareness of the relationship between the stages of the EIA process
Group size	Pairs
Duration	45 minutes

Resources required

- A set of cards (about 75 x150 mm) with the names of the steps in the EIA process written on (use local process where possible).
- Large piece of paper or overhead transparency for collating the results.
- A flowchart of the local process.

Description of activity:

- Allow each group of two to arrange the cards in the order in which they think EIA is performed.
- Get them to identify the inputs and outputs for each stage.
- Bring groups together and discuss the results, focusing on the relationship between the different stages. Emphasise that the steps are not rigid but are iterative.

1

EIA can:

- modify and improve design
- ensure efficient resource use
- enhance social aspects
- identify measures for monitoring and managing impacts
- inform decision-making
- provide justification for a proposal

2

Impacts vary in:

- type and nature
- magnitude
- extent
- timing
- duration
- uncertainty
- reversibility
- significance

3

Integration within EIA

The process of EIA has moved towards the consideration of all effects arising from a proposal. These can include:

- biophysical
- social
- health
- economic
- risk and uncertainty

4

NEPA
National Environmental Policy Act
(proclaimed in 1970)

called for

- the public statement of the environmentally significant consequences of all federal actions
- public input into project formulation
- informed decision-making

This process became known as Environmental Impact Assessment

5

Evolution of EIA:

- early 1970s — initial development
- 1970s to 1980s — trend to integration
- mid to late 1980s — cumulative effects and policy integration
- mid 1990s — towards sustainability (SEA, biodiversity)

6

Developments in the 1990s:

- major reforms to well established systems
- implementation of EC Directive (1985)
- World Bank and other agencies introduce policies
- convention on EIA in a Transboundary Context 1991
- conventions on Climate Change and Biological Diversity

7

EIA — Three core values

- ***sustainability*** — the EIA process will result in environmental safeguards
- ***integrity*** — the EIA process will conform to agreed standards
- ***utility*** — the EIA process will provide balanced, credible information for decision-making

Sadler, 1996

8

EIA — Eight guiding principles

- *participation*
- *transparency*
- *certainty*
- *accountability*
- *credibility*
- *cost-effectiveness*
- *flexibility*
- *practicality*

Sadler, 1996

9

EIA Operating principles

EIA should be applied:

- to all development project activities likely to cause potentially significant adverse impacts or add to actual or potentially foreseeable cumulative effects
- as a primary instrument for environmental management to ensure that impacts of development are minimised, avoided or rehabilitated
- so that the scope of review is consistent with the nature of the project or activity and commensurate with the likely issues and impacts
- on the basis of well defined roles, rules and responsibilities for key actors

Sadler, 1996

10

EIA Operating principles cont'd

EIA should be undertaken:

- throughout the project cycle, beginning as early as possible in the concept design phase
- with clear reference to the requirements for project authorization and follow-up, including impact management
- consistent with the application of 'best practicable' science and mitigation technology
- in accordance with established procedures and project-specific terms of reference, including agreed timelines
- to provide meaningful public consultation with communities, groups and parties directly affected by, or with an interest in, the project and/or its environmental impacts

Sadler, 1996

11

EIA Operating principles cont'd

EIA should address, wherever necessary or appropriate:

- all related and relevant factors, including social and health risks and impacts
- cumulative and long-term, large-scale effects
- design, locational and technological alternatives to the proposal being assessed
- sustainability considerations including resource productivity, assimilative capacity and biological diversity

Sadler, 1996

12

EIA Operating principles cont'd

EIA should result in:

- accurate and appropriate information as to the nature, likely magnitude and significance of potential effects, risks and consequences of a proposed undertaking and alternatives to it
- the preparation of an impact statement or report that presents this information in a clear, understandable and relevant form for decision-making, including reference to qualifications, and confidence limits in the predictions made
- ongoing problem solving and conflict resolution to the extent possible during the application of the process

Sadler, 1996

13 *EIA Operating principles cont'd*

EIA should provide the basis for:

- environmentally sound decision-making in which terms and conditions are clearly specified and enforced
- the design, planning and construction of acceptable development projects that meet environmental standards and resource management objectives
- an appropriate follow-up process with requirements for monitoring, management, audit and evaluation that are based on the significance of potential effects, the uncertainty associated with prediction and mitigation, and the opportunity for making future improvements in project design or process application

Sadler, 1996

---

14 **The EIA process:**

- screening
- scoping
- assessing
- mitigating
- reporting
- reviewing
- decision-making
- monitoring and managing
- public involvement

---

15 Flow Chart of the EIA process

---

16 **Cost of EIA: EIA Costs for Multipurpose Projects in Thailand**

Name of project	Project cost (million baht)	EIA cost (million baht)	EIA cost as percentage of total project cost
Pattani	2737.10	3.1	0.11
Que Noi (Khao Laem)	9110.00	0.7	0.01
Chiew Larn	7035.10	3.7	0.05
Upper Quae Yai	10953.00	4.5	0.04
Nam San, Nam Man, Nam Loei	7612.00	5.3	0.07
Kud	8092.00	5.0	0.06
Lang Suan	6248.00	2.4	0.04
Ma Pong	60000.00	18.0	0.03

Source: UN ESCAP (1990)

17 **Delays are caused during EIA when:**

- the EIA is commenced too late in the project cycle
- the terms of reference are poorly drafted.
- the EIA is not managed to a schedule
- the EIA report is inadequate and needs to be upgraded
- there is a lack of technical data.

18 **Benefits of EIA include:**

- more environmentally sustainable design
- better compliance with standards
- savings in capital and operating costs
- reduced time and costs for approvals
- avoids later plant adaptations
- reduced health costs
- increased project acceptance

19 **Ensuring fairness in the EIA process**

- register consultants' names and terms of reference
- name consultants and their expertise in the EIA report
- publish the terms of reference in the EIA report
- make EIA reports available to the public
- publish lists of screening and final decisions along with conditions for approval

INTRODUCTION TO ENVIRONMENTAL ASSESSMENT, ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT

Brian D. Clark

Presented at the 15th International Seminar on Environmental Assessment and Management CEMP, University of Aberdeen, 26 June–9 July 1994

INTRODUCTION

Since the 1960s growing environmental awareness has focused attention on the interactions between development actions and their environmental consequences. In developed countries this concern has led to the public demanding that environmental factors be explicitly considered in the decision-making process. A similar situation is now occurring in developing countries where it is either decision-makers in Government Environmental and Health Departments or increasingly articulate environmental objectors who are taking the lead.

Early attempts at project assessment were often crude and limited to Technical Feasibility Studies and Cost Benefit Analysis (CBA). CBA was developed as a means of expressing all impacts in terms of resource costs valued in monetary terms. A number of major developments such as the proposed third London airport and the Aswan High Dam, which were assessed using CBA techniques, caused considerable public disquiet. Flaws in CBA, such as the claimed inability to place realistic monetary values on "environmental intangibles", became apparent. One consequence was the development of a new evaluation approach which came to be known as EIA. It is important to note, however, that real attempts are now being made to link EIA, CBA and risk assessment to overcome these earlier deficiencies and to achieve new objectives in the context of sustainable development. The concept of EIA was seen by the environment lobby as a potentially useful tool to assist their cause whereas in the early 1990s EIA is now seen by many major developers as an important management tool. It has evolved as a comprehensive approach to evaluation, in which environmental considerations, as well as economic and technical considerations, are given their proper weight in the decision-making process.

When EIA was first conceived, it was regarded as an "add on" component to CBA, designed to incorporate all those potential impacts that had proved troublesome in CBA. Figure 1 illustrates the trends in the development of project assessment and indicates how EIA has evolved in recent years.

Originally EIA was conceived as a mechanism to fulfil a legal requirement. In the United States of America (USA), the first formal EIA system was enacted under the National Environmental Policy Act (NEPA) 1970. Increasingly in both developed and developing countries, environmental assessment is seen as an ongoing iterative process, which can contribute to the formulation of sound environmental management and planning strategies to help achieve sustainable development.

This paper looks at definitions of EIA and considers the major procedural stages in the process. This is followed by a review of some of the key features of EIA, such as screening, scoping, project review and public participation which are put into perspective as part of the overall EIA process. The paper then considers the concept of Sustainable Development and the role that EIA can play in implementing the concept.

Figure 1 Development of Environmental Assessment

Approximate Date	Innovations in Techniques and Procedures
Pre 1970	Analytical techniques: largely confined to economic and engineering feasibility studies; narrow emphasis on efficiency criteria and safety of life and property; no real opportunity for public review.
c 1970	Multiple objective benefit-cost analysis; emphasis on systematic accounting of gains and losses and their distribution; reinforced through planning, programming and budgeting review: environmental and social consequences not incorporated.
1970–1975	EIA primarily focused on description and "prediction" of ecological/land use change; formal opportunities for public scrutiny and review established; emphasis on accountability and control of project design and mitigation.
1975–1980	Multi-dimensional EIA, incorporating social impact assessment (SIA) of changes in community infrastructure. services and lifestyle; public participation becomes integral part of project planning; increasing emphasis on project justification in review process; risk analysis of hazardous facilities and unproven technology in frontier areas.
1980-1992	Attention given to establishing better linkages between impact assessment and policy-planning and implementation-management phases; research focus on effects monitoring, post-project audit and process evaluation: search begins for more disciplined scoping and focusing procedures and less protected forms of consultation based on negotiation and mediation.
1992-onwards	Role of EIA in achieving objectives of sustainable development. Applying EIA to policies and land use plans. Role in company environmental strategies and policies.

DEFINITIONS OF EIA

The objective of an EIA is to determine the potential environmental, social and health effects of a proposed development. It attempts to assess the physical, biological and socio-economic effects in a form that permits a logical and rational decision to be made. Attempts can be made to reduce or mitigate any potential adverse impacts through the identification of possible alternative sites and/or processes. There is, however, no general and universally accepted definition of EIA and there never can be. The following examples illustrate the great diversity of definitions:

- "... an activity designed to identify and predict the impact on the biogeophysical environment and on man's health and well-being of legislative proposals, policies, programmes, projects and operational procedures, and to interpret and communicate information about the impacts"
- "... to identify, predict and to describe in appropriate terms the pros and cons (penalties and benefits) of a proposed development. To be useful, the assessment needs to be communicated in terms understandable by the community and decision-makers and the pros and cons should be identified on the basis of criteria relevant to the countries affected"
- "... an assessment of all relevant environmental and resulting social effects which would result from a project. .. an assessment consists in establishing quantitative values for

selected parameters which indicate the quality of the environment before, during and after the action"

- "... the systematic examination of the environmental consequences of projects, policies, plans and programmes. Its main aim is to provide decision-makers with an account of the implications of alternative courses of action before a decision is made".

Such definitions provide a broad indication of the objectives of EIA but illustrate differing concepts of EIA. The scope of EIA is clearly defined in only the first definition. Three definitions include socio-economic impacts but only in the last definition is the environment mentioned. One definition implies that decision-making of the relative importance of beneficial and adverse impacts, should be part of EIA. The other definitions merely indicate that EIA is an "objective" technical and predictive exercise, with no decision-making component.

For the purposes of this paper, it is assumed that the main objective of EIA is to provide decisionmakers with an account of the implications of proposed courses of action before a decision is made. The results of the assessment are assembled into a document called an Environmental Impact Statement (EIS) which contains a discussion of beneficial and adverse impacts considered to be relevant to the project, plan or policy. The completed report, or EIS is one component of the information upon which the decision-maker ultimately makes a choice. At this stage, other factors such as unemployment energy requirements or national policies may influence the outcome of the decision. A final decision can be made with due regard being paid to the likely consequences of adopting a particular course of action and where necessary by introducing appropriate monitoring programmes.

It is probably more useful therefore to consider EIA as a process which combines not only a procedure to ensure that appropriate projects are subjected to an EIA and that the results influence the planning and execution of a project, but also a method to analyse and assess the effects of a proposal on environmental systems and the quality of the environment.

MAIN STAGES IN THE EIA PROCESS

Figure 2 generalises the main stages in the environmental assessment process as adopted in many countries. Key stages are highlighted in later sections of this paper. In some countries EIA is a direct legal requirement whilst in others it is enforced indirectly under general planning, health or pollution control powers. The stages include:

- Screening is undertaken to decide which projects should be subject to environmental assessment. Criteria used include threshold, size of project, and sensitivity of the environment.

- Scoping is the process which defines the key issues which should be included in the environmental assessment. Many early EIAs were criticised because they were encyclopaedic and included irrelevant information.

- EIA Preparation is the scientific and objective analysis of the scale, significance and importance of impacts identified. Various methods have been developed to execute this task.

- Review. As environmental assessments are normally produced by the project proponent, it is usual for a review to be undertaken by a government agency or an independent review panel. The review panel guides the study and then advises the decision-makers.

- Monitoring is normally adopted as a mechanism to check that any conditions imposed on the project are being enforced or to check the quality of the affected environment.
- Auditing is now being developed to test the scientific accuracy of impact predictions and as a check on environmental management practices.

These broadly defined stages reflect what is now considered to be good practice within environmental assessment. However it should be noted that there are other key elements which should be included, among which the participation by the public, other government departments and agencies are integral parts of the process.

METHODS FOR ENVIRONMENTAL ASSESSMENT

It is not within the scope of this paper to consider in detail the various methods which have evolved to assist the EIA process. Suffice to say the development of methods had been a direct result of legislative requirements and compliance has been a primary objective. Methods have been developed not only to identify, describe and assess the impacts of a proposal, but also to communicate the results to decision makers and the public. A distinction must be drawn between methods for environmental assessment and techniques for predicting specific impacts. All that methods offer is a means of identifying impacts, and some include guidelines for evaluation. Evaluation requires information on specific impacts which must use specialised techniques such as air pollution simulation models.

A wide range of methods has been developed to assess the scale and significance of the potential impacts of a proposal. The simplest approach has been the checklist, which lists development actions to ensure that all potential impacts are considered. Matrices relate development actions on one axis to the existing environment on the other. The Leopold Matrix, for example, assigns numerical values of significance and importance to the development proposal on a scale of 1 to 10.

As well as these simple methods, attempts have also been made to utilise more quantitative approaches. Generally these methods attempt to quantify all impacts so that total scores for a number of alternatives can be derived. Recently, increased attention has focused on the role of simulation in the impact assessment of alternative strategies for environmental management. Termed adaptive environmental assessment, involves a multi-disciplinary groups, defining the scope of the problem identify existing information determining data requirements and build a simulation model for use in identifying likely impacts.

WHAT ACTIONS SHOULD EIA COVER?

In principle, EIA should apply to all actions likely to have a significant environmental effect. In practice, for administrative and technical convenience they have normally been restricted to project assessment. The potential scope of a comprehensive EIA system is therefore considerable, and can include the appraisal of policies, plans, programmes and projects. The benefits of a "tiered" EIA structure can be noted in which the environmental implications of policies at different levels of government were regarded as the "top level" of environmental decision-making. Policies need not, in themselves, be environmental but they may have environmental consequences. The potential advantages of a tiered approach over a procedure which is restricted to development projects are:

- at the development project stage the available options are often severely limited by earlier decisions made at a higher level. Mis-specification of a project assessment (eg. a power plant) may occur if the higher levels (eg. energy policies) were not subject to such evaluation;

- assessment of individual projects can only be conducted once proposals have been made. It cannot guarantee optimum site selection, and a thorough assessment of all alternative actions may be prohibitively expensive and time consuming;

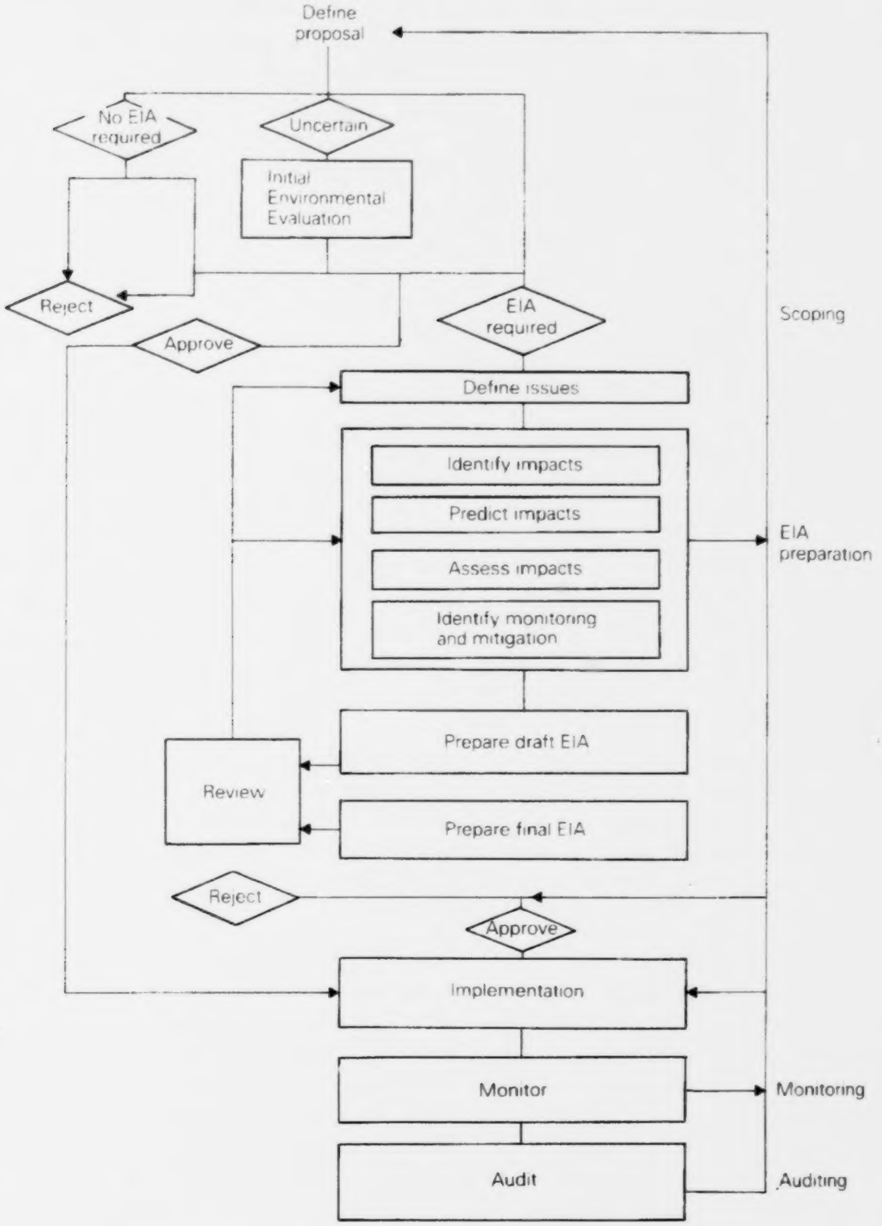

Define proposal
No EIA required
Uncertain
Initial Environmental Evaluation
Reject
EIA required
Approve
Scoping
Define issues
Identify impacts
Predict impacts
Assess impacts
Identify monitoring and mitigation
EIA preparation
Prepare draft EIA
Review
Prepare final EIA
Reject
Approve
Implementation
Monitor
Monitoring
Audit
Auditing

Figure 2. Flow diagram showing the main components of an EIA system.

- the scope of viable alternatives and a willingness to contemplate them decreases at the project level;

- and the available time for collection and analysis of environmental data is increasingly restricted at the project level unless environmental baseline data has been assembled independently of individual project EIAs.

If plans are based on a sound environmental assessment, specific project proposals which fail to conform are likely to require detailed environmental assessment. The preparation of plans must be based on adequate data relating to the existing environment and the implications of possible changes. The systematic collection, analysis, storage and regular updating of such data must, therefore, greatly improve the quality of subsequent EIAs as well as reducing time and costs. EIA and landuse planning ought, therefore, to be seen as complementary to each other.

SELECTION OF PROJECTS FOR EIA

Literature on EIA has focused on the effectiveness of EIA procedures, methods and predictive techniques in achieving desired objectives. The success of EIA, however, is only as effective as the coverage of projects to which it is applied. Little attention has been paid to the topic of selecting those projects which should be subject to EIA. This has often led to the development of case law which indicates to the agencies developments for which an EIA will be required. In countries without such a procedure, guidelines rarely exist, the decision being dependent upon the scale of the proposal, its environmental setting, uniqueness of the project and the likely degree of public opposition. Because countries have adopted different approaches large disparities exist as to the number of EIAs prepared.

There are a number of means by which project selection for EIA can be undertaken. Specified development types accompanied, in some instances, by thresholds of size, cost or power requirements, may automatically require EIA. In some countries, EISs are mandatory for certain classes of development which exceed a specific financial threshold. This approach unfortunately neglects the importance of the environmental setting of a project. The extent and significance of a particular impact depends not only on the causative agent, for example, the amount of a pollutant, but also on the sensitivity of the receiving environment. Alternatively, environmentally sensitive areas can be designated in which an EIA is required for specific developments. This approach contains the implicit assumptions that only specific development types are detrimental to certain environmental features.

SCOPING

It is difficult to over-emphasise the importance of scoping since the success of an EIA will depend largely upon how well the scoping exercise is conducted. Scoping refers to the process of identifying, from a broad range of potential problems, those key issues that should be addressed by an EIA. It attempts to focus the assessment on a manageable number of important questions. The importance attached to scoping arises from the fact that environmental assessments are usually conducted under serious limitations of time, cost and resources. Any priority-setting activity, therefore, should improve efficiency and provide a more focused product for decision-makers.

Many methods have been developed to assist scoping, which was given a legal status in the USA in the 1979 regulations to the NEPA. Depending upon the nature of the priority issues identified, the baseline study programme undertaken as part of the EIS can be structured around the results of the scoping exercise. The scoping programme may have a major influence on the entire EIA and upon the advice given to decision makers and in many instances will prevent time and resources from being wasted.

REVIEW OF EIAS

Because most EIA systems state that an assessment must be produced by the project proponent there is usually a need for an impartial, scientific and independent review. This is not to imply that all EIAs are biased and play down adverse impacts and emphasise positive ones, although there is some evidence to suggest that this occurs. The public need to be confident of impartiality and for this reason there is a need for some form of independent review.

The review authority is often likely to be the authority from which authorisation for the development is requested. Questions relating to impartiality may arise when the authorising agency has been responsible for the EIA. An independent review agency may remove any suspicion of bias in those cases where the authorising agency is an advocate for the development or holds unreasonable views against the development. The functions of the review authority may include:

- the "scope" of the assessment, ie. which projects should be subjected to a full or partial EIA: general or specific guidelines and advice on methods of EIA;
- formulation of the terms of reference and initiating a detailed EIA;
- ensuring that the EIA has been adequately completed within the terms of reference;
- submitting the EIS together with any separate contributions from other organisations, with recommendations to the appropriate authorising agency; and
- acting as a focus for the exchange of information and opinions concerning environmental affairs.

It is essential that EIA is not regarded as a procedure which is only to be utilised at the decisionmaking stages. EIA ought to be regarded as an adaptive process which continues after the decision. It would ensure that the project conforms to the standards detailed in the relevant permissions. It would provide a database for any subsequent impact study as well as allowing the monitoring and control programme to adapt to changing circumstances or increased knowledge.

PUBLIC INFORMATION AND PARTICIPATION IN EIA

Public involvement should be an integral part of any EIA system. Efforts should be made to obtain the views of, and to inform, the public and other interest groups who may be directly or indirectly affected by the project. The authorising agencies may not always identify the environmental issues which the public perceives to be important and they may also lack the detailed local knowledge that the public possesses. Advantages of participation may lead to the provision of information about local environmental, economic and social systems; the possible identification of alternative actions; an increase in the acceptability of the project as the public will better understand the reasons for the project; and a minimisation of conflict and delay. Problems may nevertheless arise. Public participation may, in the short-term, be time-consuming and increase costs, and participants may be unrepresentative of the community. In spite of these potential problems, many countries are actively encouraging public involvement in EIA and the World Bank have now made it a legal requirement before any loan can be made.

FINANCIAL ASPECTS OF EIA

Initially, EIAs may be expensive to implement, particularly in areas where little is known about existing environmental and social conditions. Design changes produced as a result of EIA findings may also increase capital costs but it can be argued that the avoidance of deleterious impacts and the maximisation of beneficial impacts will outweigh the costs of an EIA system in the long-term. The cost of an EIA system will decline once procedures and techniques have been established and assessment personnel have become accustomed to their tasks. Indeed, it can be further argued that a thorough investigation of impacts at an early stage of project planning may save money by speeding up the process of implementing a proposal.

The costs of EIA are commensurate with the complexity and significance of the problem and the level of detail required. In many countries the cost is borne by the proponent of the development, while in others it is borne by the authorising authority. In those countries with considerable experience in EIA the costs vary between 0.01 and 1.00 percent of the project value. It is misleading however, to regard the "actual costs" of EIAs as being saved if an EIA is not undertaken, for if the information is required it will have to be collected by some means.

The benefits represented by EIA have usually not been determined, because it is difficult to assign monetary values to such benefits. Many of the environmental amenities that would otherwise have been degraded or destroyed have a unique value, which over time will far outweigh EIA costs.

Many cases show that the use of EIA has allowed the choice of an option which is both environmentally and economically superior to the original choice - for example the deposition of contaminated dredge sludge from the Rotterdam port area.

The basic premise of sustainable development is that many environmental problems in developing countries originate from the lack of development that is from the struggle to overcome extreme conditions of poverty. Sustainable development is indistinguishable from the total development of society and cannot effectively be analysed separately, as "sustainability" depends on the interaction of economic changes with social, cultural and ecological transformations. Its quantitative dimension is associated with increases in the material means available to those living, or destined to live, in absolute poverty, so as to provide for adequate physical and social well-being and security against becoming poorer.

Its qualitative dimension is multifaceted, and is associated with ensuring the long-term ecological, social and cultural potential to support economic and structural change. It is not easy to measure as the quantitative and qualitative dimensions are mutually reinforcing and inseparable, and thus cannot be fully captured by any concept of direct and measurable gain.

Sustainable economic development is therefore directly concerned with increasing the material standard of living of the poor at the "grassroots" level, which can be quantitatively measured in terms of increased food, real income, educational services, health care, sanitation and water supply, emergency stocks of food and cash etc, and only indirectly concerned with economic growth at the aggregate, commonly national, level. In general terms, the primary objective is to reduce the absolute poverty of the world's poor through providing lasting and secure livelihoods that minimise resource depletion, environmental degradation, cultural disruption and social instability.

In practical terms, it is possible to think of Sustainable Development as encompassing three systems: the biological (and other resource) system, the economic system and the social system. Each system has its own unique set of goals:

Biological system goals:

- genetic diversity
- resilience
- biological productivity

Economic system goals:

- satisfying basic needs (reducing poverty)
- equity-enhancing
- increasing useful goods and services

Social system goals:

- cultural diversity
- institutional sustainability
- social justice
- participation

The general objective of sustainable economic development is to maximise the goals across all these systems through an adaptive process of trade-offs.

SUSTAINABLE DEVELOPMENT - A FRAMEWORK FOR ANALYSIS

From the 1980s sustainable development has emerged as a key concept designed to link environmental and economic analysis and activity. It is an idea that has gained currency through the work of the World Commission on Environment and Development at the Rio Summit. "Our Common Future" for example emphasises that development must meet human needs but not foreclose the environmental and socio-economic options of present and future generations. Only recently however, under the imposition of crisis and threat, has sustainability found its way onto the political agenda, and become an overarching goal and frame of reference for conservation and development strategies.

The agenda for institutional and legal reform put forward by the Brundtland Commission encompasses several priority areas for international and national action. It encompasses general recommendations for fostering more informed decision-making, including strengthening capabilities and responsibilities in resource management and environmental assessment, and contains suggestions for more effective approaches to deal with scientific uncertainty and interest-based controversy.

An operational perspective on sustainable development involves moving beyond definition and towards identifying its practical contribution to improve decision-making. This can be achieved in preliminary form by re-organising and augmenting the goals, principles and criteria that are established or implied by the themes of sustainability. Once these substantive requirements are formalised, we will be in a better position to design policy and institutional options for the practice of sustainable development including how EIA can contribute to its implementation.

ENVIRONMENTAL IMPACT ASSESSMENT AND SUSTAINABLE DEVELOPMENT

Environmental assessment and related procedures have been identified as key-mechanisms to translate the principles and criteria of sustainable development into practical strategies and action. An improvement in contemporary EIA practice is required if this is to be achieved. Existing concepts and approaches, however do contain a number of strengths and potentials that can be used in the planning and implementation of sustainable development.

Structural problems associated with the role of EIA in the larger framework of policy-making provides an entry point to consider other instrumental reforms that will be necessary to respond to the general recommendations made by the Brundtland Commission and the Rio Summit for more integrated approaches to environmental management and development planning. At the project-specific level the application of EIA exemplifies many of the fundamental challenges associated with evaluating development and making informed choices. These include coping with uncertainty and risk, dealing with conflicts in interest and preference, co-ordinating scientific analysis and public inputs, and weighing facts and values in organising information for decision-making. Environmental assessment, in microcosm, illustrates the rethinking and restructuring of the environment and development decision making process that must take place in order to "deliver" sustainable development.

At a general level, a number of ways that EIA can respond and contribute to achieve more sustainable forms of development can be listed. These are:

Focus on Cumulative Impacts

The achievement of sustainable development requires a synoptic ecosystem approach, that relates to the dynamics of natural variability and the effects of human intervention on key indicators of biodiversity and productivity. The concept of cumulative effects, of the incremental reduction and erosion of the integrity of natural systems from the interactions of multiple activities, provides a perspective to redirect impact analysis to deal with the driving causes of unsustainable development. Cumulative analysis is one response to the structural inadequacy of the conventional project and site specific application of the EIA process. An explicit attempt to analyse and monitor cumulative changes at a regional or local scale lends itself to the establishment of notional ecological thresholds or carrying capabilities.

Make the Process More Problem Focused and Value Based

Conventional EIA tends to focus on a limited range of projects and activities. Many other development decisions and resource management practices escape any form of assessment, even though their collective impact may be greater than that of individual large-scale and hazardous facilities. Class assessments may yield an extended approach to identifying and mitigating cumulative effects. This approach should be supported and augmented by environmental and social impact monitoring and other control and evaluation procedures. Whatever institutional arrangements are utilised to make EIA more problem-focused, they should be explicitly geared to coping with the unexpected.

Move from React and Cure to Anticipate and Prevent

For the delivery of sustainable development, environmental considerations must be better integrated into all economic decisions. A crucial role for EIA is the application of some type of systematic assessment to the highest levels of policy making. The Canada-United States Free Trade Agreement, for example, appeared to proceed with little or no serious review of its environmental implications. Policy and programmatic assessments of national and regional development proposals, which shape the economic future of Canada and the provinces, will need to take a different form from conventional project EIA.

Link Policy, Planning and Assessment

In terms of the process of decision-making, the pursuit of sustainable development encompasses three critical phases. These deal with the justifications, location and mitigation of proposed activities. Project EIA tends to focus largely on the latter. The approach will work most effectively and efficiently when policy and planning processes are in place that deal with the first two areas of concern and so yield a coherent context for impact evaluation, development control, and learning from experience. Figure 2 outlines an integrated framework for environment and economic decision-making that links existing and emerging planning instruments. This framework identifies the possibilities for dovetailing the preparation of conservation strategies, with the longer-standing focus on regional economic diversification. Ideally, both strategies should be designed and deployed as reciprocal blueprints for sustainable development.

SUSTAINABLE DEVELOPMENT: SELECTED APPROACHES TO EIA AND ENVIRONMENTAL MANAGEMENT

There are now many approaches that can be identified which would appear to support the practical application of more sustainable forms of development. For illustrative purposes 11 are identified but it is stressed that these are indicative rather than comprehensive.

1. Ecological Framework for EIA

This framework encompasses an improved approach to environmental impact assessment. Based on the results of a thorough review of Canadian experience in EIA, this approach urges adherence to basic ecological concepts within a clear, scientific approach. Specifically, this requires the identification of study boundaries, quantification of data, analysis based in modelling, results that provide predictions, and careful design of a study strategy incorporating a commitment to monitoring. To ensure these requirements committees of experts advise agencies on scientific matters related to impact assessments. Within this context the framework focuses on Valued Ecosystem Components (VECs), which are the environmental attributes considered by society to be important in project decisions. Identified through a scoping exercise with public involvement, the VEC guide the conceptualisation and design of the assessment.

2. Impact Hypothesis Statements

This is an approach which describes the major biophysical and social processes that connect a development activity with its potential environmental effects. It provides a focusing mechanism for environmental research of all kinds, but especially for systematic and testable predictions in EIA. The impact hypothesis itself consists of the linking of potential development impacts to individual VEC through the use of simulation models or other means of making connections like statistical analysis or experimental work.

Although the impact hypothesis approach essentially remains oriented to the single project EIA, it provides a common framework for a comparison of projects. As a well-defined framework with an explicit mechanism for prediction and an emphasis on monitoring, it provides decision-makers with a firm basis for learning and adaptation. The adaptive capability of the approach is complemented by its strong emphasis on systems analysis. Modelling and testing of impact hypotheses in a multiinterest workshop situation facilitates an interactive process and provides a greater opportunity for filling a range of human needs than does the expert, biophysical bias of the ecological framework.

3. Environmental Impact Assessment Audits

Audits are essentially hindsight evaluations of EIAs which examine environmental impact studies and statements in light of postdevelopment monitoring and research to see how well impacts were predicted and how appropriate were prescribed mitigation measures. In this role, they provide the basis for the evaluation of the accuracy and utility of environmental impact forecasts, leading to increased effectiveness and efficiency of EIAs at the technical and administrative levels. They also have the potential to take the frame of reference for EIA beyond its traditional confines to meet a wider range of principles for sustainable development.

While maintaining the bias towards improving the prediction of impacts, postdevelopment audit can extend the role of EIA into the policy or goal-seeking sphere by providing a basis for the assessment of the contribution of developments to broad social goals. Through the learning opportunity that audit creates it can improve knowledge of ecosystems upon which the pursuit of ecological integrity is based and improve the EIA process itself.

4. Cumulative Effects Assessment

Cumulative effects take a variety of forms, including frequent and repetitive or high density impacts on a single environmental medium; synergistic effects from multiple sources on a single environmental medium; impacts resulting some distance from the source; and secondary impacts resulting from a primary activity. Methods of cumulative effects assessment (CEA), attempt to analyse and predict the potential for a range of effects, accumulating from actions over space and time, using techniques such as matrices, causal analysis, and systems modelling.

Like impact assessment audits, CEA is a direct response to perceived deficiencies in conventional approaches to EIA. While maintaining an impact orientation, CEA takes EIA beyond the project level to program and policy level concerns. In making this transition, the approach begins to address a larger selection of principles for sustainable development. Primarily, CEA meets the process requirements of a system perspective, and integration, by broadening the spatial and temporal scope of EIA, taking a more comprehensive and interdisciplinary approach, and integrating EIA with impact monitoring and management systems. In addition, the approach forces the analyst to be creative, facilitating a goalseeking approach, and it confronts the possibility of change in physical, social and ecological systems through an adaptive analytical framework.

5. Bargaining in Impact Assessments Monitoring and Management

This approach moves beyond EIA to describe how impact assessment, monitoring and management (IAMM) can all be enhanced though improved processes of interaction between people in resolving issues and seeking agreement. Central themes are bargaining, mediation, and negotiation in the resolution of conflicts involving scientific and social issues, usually in a project-specific context. A focus on bargaining and negotiation in IAMM holds potential for supporting sustainable development through the pursuit of equitable decision-making practices. The approach also serves to remind us that conflicts are inherent to the pursuit of sustainable development priorities, and their effects cannot be ignored.

6. Adaptive Environmental Assessment and Management

This approach differs from EIA not only in its broader application but in its bias towards coping with uncertainty rather than improving predicability. The aim of Adaptive Environmental Assessment and Management (AEAM) is to integrate environmental with economic and social understanding throughout the environmental policy and design process, responding to the effects of management as it proceeds. It has three components (ESSA 1982):

- The concepts of Adaptive Management - the practice of recognising uncertainties and designing policies or management strategies that can be used to learn and adapt in response to unexpected events, accumulation of knowledge, or active experimentation;
- The methods of Systems Analysis - the collection of quantitative and qualitative tools used to characterise, mimic, and simplify dynamic systems; and

- The procedures of Modelling Workshops - intensive, highly focused "brain-storming" sessions which develop and use simulation models to provide a forum for communication and collaborative solving.

The AEAM approach supports the process-oriented principles for sustainable development most thoroughly greatly exceeding the potential of narrower, more traditional EIA methods. As the name suggests, AEAM is founded on adaptive strategies, in which learning is as important as problem solving, resilience is a higher priority than prevention, and objectives and designs are formulated that can benefit from the unexpected. However, the notion of adaptation goes beyond strategy to prescribe interactive forms of organisation, approaches to analysis that place priority on systemic relations, and an ideology that condones the purposeful influencing of policy (goal-seeking) by AEAM Processes.

The goal-seeking priority permits AEAM to support substantive principles through a prescriptive orientation. However, the commitment of the approach to the substantive principles for sustainable development is still somewhat ambiguous.

7. Sustainable Redevelopment

This term, means the ecological rehabilitation of degraded natural environments and renewable resources towards sustainability. The components of sustainable redevelopment must include ecological rehabilitation but will also include social and economic themes like reforestation resettlement, reform and revitalisation. The approach is explicit in its adherence to the substantive priorities of maintaining ecological integrity and meeting human needs.

8. Impact Zoning

This approach provides a framework to guide development decision-making based on the ecological concept of carrying capacity. Impact zoning requires the locating of development in areas that had been predetermined, through inventory and classification, as suitable for the use proposed on the grounds of biophysical capability. At one extreme would be a zone of areas with such ecological significance that no development would be permitted. At the other extreme would be a zone in which impact assessment requirements could be relaxed, for areas clearly suited to development which are environmentally undistinguished. Between these would be an integrated use zone, subject to the usual market forces, with environmental assessment as a routine and integral requirement for development.

In contrast to the "act locally" emphasis of sustainable redevelopment this approach returns us to the emphasis on broader-scale integration of management across administrative sectors at the regional level that is characteristic of the more centralised, process-oriented approaches such as cumulative effects assessment.

The impact zoning approach is most notable for its consistent and explicit adherence to the substantive principle of maintaining ecological integrity. Where other approaches waver in their commitment to ecological constraints on development as a "bottom line" for decision making, impact zoning is founded on a closed system definition of carrying capacity and the awareness of humankind's dependency on the biological productivity of ecosystems.

9. Integrated Resource Management

Integrated Resource Management (IRM) is an approach that attempts to bring a wider range of needs and dues into the decision-making process and to deal with planning, assessment and implementation in concert. Generally, the philosophy behind the approach has much in common with that of sustainable development in its promise to facilitate convergence between resource development and environmental protection.

A consensus has not emerged on a standard set of procedures for IRM, but certain components are consistently emphasised, namely strategic planning; quantitative, scientific methods; consultative procedures; and analysis of dynamic processes, flows and linkages. All of the process-oriented principles for sustainable development are thus well met by IRM; strategic planning ensures a proactive, goal-seeking approach; an emphasis on consultation and comprehensive coverage encompasses interaction; systems perspectives are integral to all IRM techniques; and an emphasis on flexibility, responsiveness, and learning from experience reflect the adaptive priority.

The substantive principles are also taken into account by IRM. Human needs are addressed in some versions through "valued ecosystem components", and more generally through inclusion of social and economic factors in systems analysis. Equity and social self-determination may also be encompassed by IRM to the extent that communities in the management area are included in the planning process.

10. Modified EIA and Indicators of Sustainability

Dalal-Clayton in his paper "Modified EIA and Indicators of Sustainability: First Steps Towards Sustainability Analysis" (1992), argues that the achievement of sustainable Development requires the development of a framework of appropriate "tools" to aid project, programme and policy development and implementation. This framework could be called "Sustainability Analysis", and would be necessary in order to implement NSDP's. EIA, if used appropriately, should integrate environmental. social and economic systems. but rarely does. These elements are the three most vital components of sustainable development. Although EIA alone cannot development sustainable it can push decision makers along the path towards sustainability. In this way "EIA is a tool in the kit bag for the development of NSDP's" (Dalal-Clayton 1992) and that Sustainability Analysis is in fact modified EIA.

Dalal-Clayton (1992) suggests that modified EIA procedures should be developed on an issue basis, focusing on problems with significant social and economic dimensions, in order to build on lessons learned and that, in due course, issue specific guidelines for modified EIA will need to be considered by both donor agencies and governments.

11. The Ultimate Environmental Threshold (UET) Method

This method addresses environmental threats posed by development. Development should be considered from four major environmental dimensions: territorial, quantitative, qualitative and temporal. The dimensions determine constraints, called Ultimate Environmental Thresholds (UETs) which should indicate where, at what scale and which kind of development should take place, over what time period or at what rate, so that a sustainable use of natural resources can be secured.

POST RIO - AGENDA 21 AND SUSTAINABLE DEVELOPMENT

The route to sustainable development is now taking shape. Agenda 21 is a guide for business and government policies and for personal choices into the next century. It was endorsed by the 1992 Earth Summit in Rio de Janeiro, Brazil, the largest-ever meeting of world leaders. This meeting took place during the United Nations Conference on Environment and Development which brought together the heads or senior officials of 170 governments. They were joined by hundreds of officials from United Nations organisations, municipal governments, business, scientific, non-government and other groups. Nearby, the '92 Global Forum held a series of meetings, lectures, seminars and exhibits on environment and development issues for the public. This drew 18,000 participants from 166 countries, as well as 400,000 visitors. There were 8000 journalists covering the Rio meetings, and the results were seen, heard and read around the world.

RIO RESULTS - EIA AND SUSTAINABLE DEVELOPMENT

Rio produced two international agreements, two statements of principles and a major action agenda on world-wide sustainable development. Of interest are the following:

- The Rio Declaration on Environment and Development. Its 27 principles define the rights and responsibilities of nations as they pursue human development and well-being.
- Agenda 21, a blueprint on how to make development socially, economically and environmentally sustainable.

Agenda 21 explains that population, consumption and technology are the primary driving forces of environmental change. It lays out what needs to be done to reduce wasteful and inefficient consumption patterns in some parts of the world, whilst encouraging increased sustainable development in others. It offers policies and programmes to achieve a sustainable balance between consumption, population and the Earth's life-supporting capacity. It describes some of the technologies and techniques that need to be developed to provide for human needs while carefully managing natural resources.

Agenda 21 provides options for combating degradation of the land, air and water, conserving forests and the diversity of species of life. It deals with poverty and excessive consumption, health and education, cities and framers. There are roles for everyone: governments, business people, trade unions, scientists, teachers, indigenous people, women, youth and children. Agenda 21 does not shun business. It says that sustainable development is the way to reverse both poverty and environmental destruction.

The success of economic development is currently gauged by the amount of money it produces. Accounting systems that measure the wealth of nations also need to count the full value of natural resources and the full cost of environmental degradation. The polluter, should, in principle, bear the cost of pollution. To reduce the risk of causing damage, environmental assessment should be carried out before starting projects that carry the risk of adverse impacts. Governments should reduce or eliminate subsidies that are not consistent with sustainable development.

A major theme of Agenda 21 is the need to eradicate poverty by giving poor people more access to the resources they need to live sustainably. By adopting Agenda 21, industrialised countries recognised that they have a greater role in cleaning up the environment than poor nations, who produce relatively less pollution. The richer nations also promised more funding to help other nations develop in ways that have lower environmental impacts.

In the Rio Declaration, Conventions and Agenda 21 EIA is given considerable emphasis as to its potential ability to help achieve more sustainable forms of development. Specifically Principle 17 of the Rio Declaration states that "Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have significant adverse impacts on the environment and are subject to a decision of a competent national authority". Chapter 8 of Agenda 21 refers to the importance of integrating environment and development in decision making.

Both Agenda 21 and the Rio Declaration focus on the need for effective EIA processes and call for an informed and practical response to integrating environment and decision-making in support of sustainable development. As a result, they impose new demands on environmental assessment and call for informed response by competent authorities at the highest level.

THE ROAD FROM RIO

Agenda 21 and the other Rio documents form a series of stepping stones towards a more socially, economically and environmentally sustainable world. The challenge is to put the good ideas from Rio into action, refine them and develop more detailed plans. In this EIA will play a critical role.

The UN is increasing help for nations to implement sustainable development. A high-level UN Commission on Sustainable Development has been created. It will monitor and report on how the world is living up to commitments made in Rio. By 1997, the United Nations will hold a special session to review progress in reaching the goals of the Earth Summit.

National Sustainable Development Strategies (NSDSs) are identified as a key mechanism for implementing Agenda 21 and the other decisions taken at the Earth Summit. The processes are still under various stages of development. At an international level, there are also numerous comprehensive and sectoral strategies, of which Agenda 21, itself and Caring for the Earth (World Conservation Strategy II) are the best known and most instructive examples.

These documents, and recent experience with national conservation strategies, illustrate key principles and guidelines for preparing NSDs:

- sustainable development is an overarching goal and frame of reference that involves striking a balance between social, environmental and economic objectives
- these objectives must be clearly expressed in the form of priorities, targets and timetables
- processes and means for achieving these ends must be integrated, adaptive participatory and action-oriented; clearly this is a key role for EIA
- implementation and results of strategies and supporting plans must be monitored and evaluated and adjusted; so that
- the process is iterative, and enabling and capacity enhancing.

Sustainable development represents a synthesis of concerns about development and concerns about the environment. It is important that in meeting the needs of the present the ability of future generations to meet their own needs is not compromised. It is development itself not the environmental base as such which must be sustained. Development is about sustaining what needs to be sustained as well as changing what needs to be changed. If universal economic growth is impossible, must one abandon the goal of "sustainable development" or can one define development in other ways which are in fact sustainable? More generally, if there has to be a trade-off between environmental protection and development, we have to know why both are ethically important.

CONCLUSIONS

EIA is a mechanism which aids the efficient use of natural and human resources, and has proved valuable both to those promoting developments and those responsible for their authorisation. EIA may reduce costs and the time taken to reach a decision by ensuring that subjectivity and duplication of effort are minimised. In addition it can identify and attempt to quantify primary and secondary consequences which might necessitate the introduction of expensive pollution control equipment, compensation payments or other costs at a later date.

There are a number of ways in which EIA can improve the efficiency of decision-making, but to be effective EIA should be implemented at an early stage of project planning and design. It must be an integral component in the design of projects rather than something utilised after the design phase is completed. Preferably, EIAs should be part of an incremental decision-making process which has a number of decision-points in the project planning procedure. This means that there can be a continuous feedback between EIA findings, project design and locations. EIAs can be implemented to test alternative project designs at an early stage and to help choose the project design which emphasises benefits and minimises harmful effects. EIA therefore can be used not only to investigate and avoid harmful impacts, but also to increase likely benefits.

The emergence of an optimum alternative in terms of the objectives or goals relevant to a proposed project means that EIAs may have significant long-term financial advantages. If a potential problem is identified early in project planning it may allow considerable financial savings to be achieved. At the crudest level the abandonment of a project may be required in terms of likely detrimental effects. This type of action is, however, very rare and normally design modifications can produce an environmentally acceptable project which at the same time will often reduce the need for expensive ameliorating action once a project becomes operational. If a development is not assessed for its likely impacts. it may cause serious social and health problems.

The incorporation of EIA into decision-making may create a number of benefits. If a forecast of the likely impacts of developments is available, allowances can be made and the infrastructure can be provided in a manner whereby impacts are minimised. Where uncertainty exists as to future development, EIA can identify those areas most susceptible to adverse impacts and so guide site selection. To be effective, EIA can only be used when the alternative sites are few in number, otherwise the process can be time-consuming and expensive. EIA can, nevertheless, aid the identification of the most suitable site in terms of benefit maximisation and reduction of harmful effects. Should no site be considered suitable, then the results of an EIA can aid the determination of broad environmental, social or health criteria to be used when a large number of sites are screened for their suitability.

For many reasons therefore, EIA would appear to have a key role to play in the way that proposed new developments, both in developed and developing countries, should be assessed. EIA does not provide a solution, but if conceived as a tool to assist rational development it has great potential to those planning, authorising and operating projects. If the concept of sustainable development is to be achieved, as so eloquently promulgated by Gro Brundtland, in the World Commission of Environmental and Development Report, "Our Common Future", and Agenda 21 (Rio) is to be implemented, environmental assessment will be a key element in the process. As a tool EIA can attempt to balance the legitimate desire to achieve economic growth whilst at the same time protect the environment. All the evidence suggests that EIA should be able to make a useful contribution, but only if we see it as having a wider definition than sadly being implemented in many European countries at the present time.

CONVERGING OPPORTUNITIES

Charles S. Pearson

in Down To Business—Multinational Corporations, The Environment and Development
World Resources Institute, Washington, January 1985.

CONVERGING OPPORTUNITIES

Perception and understanding of the environmental problems of developing countries, of the role of foreign direct investment in economic development, and of the potential contribution of multinational corporations (MNCs) to improving environmental and resource management have evolved rapidly over the past decade. [1] The prevailing view of environment and economic development has undergone a remarkable 180-degree turn in many developing countries since the 1972 U.N. Conference on Human Environment in Stockholm. At that time environmental problems were viewed primarily as a concern for rich countries. Environmental degradation in developing countries, when considered at all, was thought to reflect the attributes of poverty, and the overarching task was rapid economic growth. Thoughtful observers questioned whether poor countries could afford the luxury of environmental protection.

Moreover, many developing countries were deeply suspicious of an "environmental ethic" pressed on the poor by the rich after plundering their own resources. In a political interpretation, some saw the environmental movement as a ploy by the rich countries to maintain dominance in industrial production by condemning developing countries to permanently inferior status as "hewers of wood and drawers of water" who supply cheap raw materials to the developed countries within a grossly inequitable international economic system. Thus, the former Brazilian Ambassador to the United States, João Augusto de Araujo Castro, wrote in 1972 that "the implementation of any world-wide environmental policy based on the realities of the developed countries tends to perpetuate the existing gap in socio-economic development between developed and developing countries and to promote the freezing of the present international order."[2]

Suspicion about the newly-found environmental ethic in the North mirrored larger economic tensions at that time between North and South. Although in practice multinational corporations frequently reached mutually satisfactory working relations with host governments, public rhetoric was often emotional and strident. Within the U.N. system, demands mounted for a New International Economic Order, directed in part against MNCs, which would redress perceived inequities and alter the balance of economic power.

The prevailing view in the mid-1980s stands in sharp contrast. Most developing countries now recognize that environmental deterioration is a serious problem going well beyond the attributes of poverty and deserving of explicit attention. Furthermore, the view is gaining ground that reasonable measures to prevent or mitigate environmental degradation are not unduly costly, and indeed are necessary in some cases to achieve sustainable development. Behind this shift in attitudes is a growing understanding of the nature of environmental problems that developing countries confront and increasing physical evidence of serious resource and pollution problems. While the attributes of poverty—poor sanitation, endemic disease, grossly inadequate housing—remain critical, (and in some places worse), attention has shifted to environmental measures that protect productive resources and to more traditional pollution problems. Maurice Strong, the Secretary General of the Stockholm Conference, recently stated that "the pollution problem is moving South."[3] Developing countries have become strong supporters of the U.N. South Environment Programme.

One result of the change in attitude and understanding in many developing countries is comprehensive environmental-protection legislation, as well as constitutional provisions for environmental protection. As illustration, research for this project describes the introduction of such legislation, agencies, or constitutional provisions in Indonesia (1978), the Republic of Korea (1980), Brazil (1981), Mexico (1982), Turkey (1983), and the People's Republic of China (1984).

Attitudes within developing countries toward multinational corporations have also changed and are generally less contentious. This reflects greater pragmatism built on increased experience. But these changes in attitude also reflect considerable success by host countries in strengthening their negotiating skills and devising new arrangements that increase local control and their net benefits. These new arrangements include joint ventures, "unbundling" of the investment package, turnkey projects, management contracts, and contingent royalty schemes.[4]

Corporate attitudes toward environmental protection also appear to have shifted, although the evidence is still thin and the depth of the shifts is uncertain. Many large multinational corporations have come to realize that environmental regulations have become a permanent part of the business climate, first in industrial countries and now in developing countries, and that in the long run cooperation is more productive than dogged opposition. Some corporations have come to accept environmental protection as a legitimate social responsibility of business, some see merit in trying to influence the form of environmental regulations through active cooperation with governments, and some have resigned themselves to following the new rules of the game. This progress, although uneven, is likely to continue. Multinational corporations in developing countries have demonstrated remarkable adaptability to different regimes, although corporations' quest for stability and predictability in regulations remains a high priority. [5]

Illustrating a shift within corporations are their efforts in seeking a cooperative role at the national and international level. An example is the joint sponsorship by the International Chamber of Commerce and the U.N. Environment Programme of the World Industry Conference on Environmental Management (WICEM) in November, 1984. Another example, at the industry association level, is the Agricultural Chemicals Dialogue Group sponsored by the Conservation Foundation, which agreed in 1983 to guidelines for advertising pesticides in developing countries.[6] The joint program of the U.S. Agency for International Development (USAID) and U.S. industry, sponsored by the World Environment Center, in which U.S. firms provide technical assistance in industrial pollution control to developing countries, further indicates that international business sees merit in cooperation.

Despite these positive signs, it would be naive to believe that all corporations have been converted and willingly accept emerging environmental regulations. Some firms do not, and continue to work against existing and proposed regulations at the national and international level.

Recent changes in the international economic climate have a more mixed effect on foreign direct investment, environment, and development. The global recession of 1980-1983, depressed commodity prices, and a sharp contraction of international commercial bank lending to developing countries due to the debt crisis have slowed foreign and domestic investment in major natural resource development projects in the Third World. This pause in natural resource investment could inadvertently provide a welcome opportunity for improving environmental protection during the planning and design stages of natural resource projects. But the deepening poverty of large segments of society in the Third World can only accelerate environmentally destructive agriculture and forestry practices. Moreover, economic decline and austerity programs may undercut developing countries' willingness to spend money on pollution control. Finally, the acute foreign exchange shortage may have at least temporarily increased the bargaining strength of MNCs and reversed trends in the financial terms on which foreign direct investment enters.

Direct investment through multinational corporations is likely to emerge as a relatively more important source of international capital in the next decade. Massive sovereign risk lending (guaranteed by borrowing governments) by commercial banks has proved unsustainable and has led to critical debt levels. In contrast, foreign direct investment builds no external debt and is tied to specific projects. Profit remittances are thus more closely related to earnings and servicing ability. If direct investment does accelerate, the environmental activities of MNCs will become increasingly important.

Thus, the convergence of several factors—both perceptions and practices—within developing countries, within the business sector, and more speculatively, within the international economy, create a need and an opportunity to seek positive steps to improve environmental and resource management in developing countries.

ENVIRONMENT AND DEVELOPMENT

Growth versus Environment

Assessing the role of multinational corporations in environmental management in developing countries first requires understanding the relations between environmental quality and economic development .

Is there a trade-off between economic growth and environmental quality? The answer is crucial for setting appropriate environmental standards and for correctly allocating scarce resources between economic production and environmental protection. The answer also sheds light on whether environmental problems of poor countries are qualitatively different from those of rich countries, and on the validity of the currently popular "sustainable development" strategy.

In contrast to earlier views, it is now commonplace to conclude that there is no fundamental incompatibility between economic growth and environmental quality. For example, the Organization for Economic Cooperation and Development (OECD) concludes that ". . . in the long run environmental protection and economic development are not only compatible, but interdependent and mutually reinforcing."[7] The premise of the influential World Conservation Strategy is that ". . . conservation and development are, and must be, convergent and not conflicting goals."[8] But the view is not universally shared. Robert Dorfman, an expert on environmental economics, writes:

> *. . . the poorer countries of the world confront tragic choices. They cannot afford drinking water standards as high as those the industrial countries are accustomed to. They cannot afford to close their pristine areas to polluting industries that would introduce technical know how and productive capital and that would earn urgently needed foreign exchange. They cannot afford to bar mining companies from their unexploited regions. Nor can they afford to impose antipollution requirements on these companies that are as strict and expensive as those in richer industrial countries. They should always realize that environmental protection measures are financed out of the stomachs of their own people; the multinationals cannot be made to pay for them.*[9]

Reconciling these divergent views requires making some subtle distinctions. Two strands of thought separately lead to the conclusion that economic growth and environmental protection are compatible. The influential Founex Report, prepared in 1971 for the

Stockholm Conference, broadened the scope of environmental concerns by arguing that environmental problems are of two types—the "effluence of affluence" typical of rich countries and the "pollution of poverty" typical of poor countries.[10] The first includes such problems as growing waste loads, safe use and disposal of toxic substances, and the loss of wildlife and wilderness areas. In the second category, the attributes of poverty—endemic disease, grossly inadequate housing, unsanitary water supplies—are viewed as the dominant and controlling feature of the human environment in many developing countries. The Founex redefinition and broadening was a great tactical and political success. It helped dispel the then prevailing view in developing countries that environmental concern was for rich countries only. As a result, developing countries took a leadership role at the 1972 Stockholm Conference.

But the logical conclusion of the Founex redefinition is that:

> *. . . development becomes essentially a cure for their [developing countries'] major environmental problems. For these reasons concern for the environment must not and need not detract from the commitment . . . to the overriding task of development of the developing regions of the world.*[11]

Thus, according to Founex, there is no tradeoff between environmental improvement and economic growth because growth remedies the environmental problem.

The second strand of thought, the productivity approach, emphasizes that many natural and environmental resources under extreme stress in developing countries—forests, soils, fisheries, water resources, biological resources—are essential to maintaining the production of conventional goods and services.[12] It follows that measures to protect environmental and natural resources are necessary to achieve continuing economic growth, and the alleged trade-off between growth and environmental protection disappears—at least in the long run. The focus on maintaining the productivity of resources links this approach to the concept of sustainable development.

Whereas the Founex approach sees growth as the remedy for environmental problems, the productivity approach sees environmental protection as necessary for growth. Both agree that growth and environmental quality are compatible and reinforcing.[13]

Both the Founex and the productivity approaches offer insight into the relation between environment and development, but the insight is incomplete and the implicit policy conclusions of each can be misleading. From the Founex redefinition, one could conclude that if economic growth remedies environmental problems, environmental protection measures per se are unnecessary, and even might divert resources from the compelling task of economic growth. The productivity approach, to the extent that it concentrates on the role of the environment in the production of conventional goods and services, neglects the economically valuable, directly consumed services that the environment provides, such as household water. And, by melding protection of natural and environmental resources with economic growth, the productivity approach risks concealing the hard choices, pointed out by Dorfman, between the costs of environmental protection and economic output.

A better perspective may be to view environmental quality (or environmental degradation) as both a consequence of and a constraint on economic growth. Environmental effects occur as the result of economic activity — during resource extraction, processing, distribution, and consumption. During extraction, the problem may be residual discharge (e.g., acid mine runoff) or a deterioration in the quality of environmental resources available for other uses (e.g., loss of wildlife habitat or wilderness areas). A principal problem during processing is effluent and emission discharge and disposal of toxic wastes. Consumption is a misnomer.

Economic goods are not "consumed" when used, but become another source of wastes if not recycled.

The law of conservation of matter suggests that residuals discharge will increase with economic growth unless there is a sustained decrease in the materials content of economic goods and services or a sustained increase in materials recovery and recycling.[14] With the limited assimilative capacity of environmental media to absorb wastes and render them harmless, and in the absence of pollution-abatement measures to modify the form, dilution, or location of waste disposal, economic growth leads to environmental deterioration. These causal relations between economic production and environmental quality hold in rich and poor countries. The empirical question, examined below, is whether such variables as the endowment of unused assimilative capacity and the level of economic output are sufficiently different to say that environmental problems are dissimilar in rich and poor countries.

Environmental quality is also a constraint on economic growth in all countries, although its manifestations may differ. The constraint takes two forms. First, environmental resources are inputs into production, even if unpriced or underpriced. The most obvious examples are in renewable resources such as agriculture, forestry, and fisheries. If environmental degradation impairs the productivity of basic biological processes, conventional economic growth slows or halts. As examined below, developing country economies are more dependent on renewable resources; and, hence, they are directly vulnerable to environmental constraints on economic production. Environmental degradation can also reduce output (or make production more costly) in the industrial sector. For example, expenditures on water purification for industrial processes increase costs (reduce output). Air pollution corrodes materials and requires accelerated replacement or additional expenditure on materials protection. Labor itself is a productive resource. Air and water pollution that cause health problems reduce worker productivity and divert scarce resources to health care. These economic costs are additional to the personal costs of poor health and premature death that individuals and their families bear. Because environmental deterioration can both directly reduce productivity and divert scarce resources, making production more costly, the need for environmental protection to maintain the productivity of conventional economic resources is universal.

Environmental resources also provide services that are directly consumed—clean air and water, recreational opportunities, amenities. Although these services seldom pass through organized markets, and thus have no market prices, they nonetheless have economic value. Conventional economic accounting (e.g., GNP per capita) fails to measure them, but such services do contribute to human welfare. While the implicit price or value of some of these directly consumed services may differ in rich and poor countries, many have high value even in poor countries.

Yet, just as environmental degradation limits economic growth, environmental protection constrains growth. Examples are legion. The United States Council on Environmental Quality reports that $380 billion was spent in the United States on air, water, and solid waste pollution abatement and control between 1972 and 1981.[15] The Survey of Current Business reports expenditures of $8.5 billion on investment in pollution control by U.S. business in 1982 alone.[16] Edward Dennison reports that expenditures on environmental protection may have reduced U.S. productivity growth by 0.22 percent between 1973 and 1975 and by 0.08 percent between 1975 and 1978.[17] These costs, which represent the diversion of real resources away from producing conventional economic goods and services, cannot be dismissed. At some level of environmental protection, a tradeoff between conventional economic growth and environmental quality is real and cannot be avoided.

The objective of policy should be to pursue environmental protection to the point at which the additional benefits of protecting productive resources and directly consumed environmental services equals the opportunity cost (other economic output foregone) of using scarce resources for environmental protection. The principle holds for rich and poor countries alike, although uncertainties and valuation problems make it exceptionally difficult to put this principle into practice.[18] Irreversible changes and unanticipated adverse environmental effects suggest cautious policies.

Environmental problems do differ between developing and developed countries in one important respect. In the poorest developing countries, and among the poorest segments of certain middle-income countries, a vicious cycle of poverty and environmental and resource degradation is at work, one with no strong parallel in higher-income groups and countries.[19] The outlines of the problem are well-known: population growth and pressures on food supplies, rising prices for conventional fuels, and severely limited employment opportunities outside traditional agriculture have led to environmentally destructive practices in agriculture, exploitation and abuse of forest resources, and overfishing and depletion of fish stocks. While ignorance, externalities, and inappropriate property rights (for instance, short term tenancy or unrestricted access to fragile soils) compound the problem, a principal factor is poverty itself.[20] The current need for food and fuel is compelling even at the cost of future deprivation. In economists' terms, the private time rate of discount for future versus current consumption for the very poor is so high that the resource base itself is consumed. The "stock" of environmental capital is depleted. Solving this type of environmental problem requires attacking both poverty and resource degradation. It is unlikely that the cycle can be broken by focusing exclusively on either economic growth or on resource conservation.

Sustainable Development

The concept of sustainable development attempts to unite the need for current economic output with the need to maintain the continued productivity of environmental and natural resources. Unfortunately, the idea is difficult to define. Arguably, the term itself is redundant—development that is not sustainable is not really development. If defined too broadly it loses meaning. Consider the International Union for Conservation of Nature and Natural Resources' (IUCN's) definition in the World Conservation Strategy. Development is

> . . . the modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life" and to be sustainable it must "take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long-term as well as the short-term advantages and disadvantages of alternative actions.[21]

Although elusive, the concept of sustainable development is important and does deserve attention. The economic problem is that of maximizing a continuing flow of socially useful goods and services, which are derived from a mixed portfolio of "assets"—non-renewable resources, renewable resources used for economic production, natural resources whose services are directly consumed or that indirectly support conventional production, physical capital, and human capital (which, broadly defined, includes all technological knowledge). Both the composition of the asset portfolio and composition of the flow of goods and services produced by the assets changes over time. Some assets are reproducible while some are not.[22]

One obstacle to achieving sustainable development is traditional economic accounting, which, at best, incompletely measures flows and generally neglects stocks. Using this accounting system is akin to running a corporation with some income statement data (mainly current transactions) but no balance sheet. Thus, for example, exploiting a virgin forest by logging temporarily increases income as measured by GNP, but the depreciation of the capital stock (natural resources) is nowhere recorded as a charge against income. While the logging may be a good idea, a basic criterion for sustainable development—that enough income be generated to replace the forests with assets of equal value—is left unmeasured by GNP accounting. This test of replacing assets is valid for examining fossil fuels, minerals, and other nonrenewable resources. But in calculating the gains and losses, it should be remembered that some natural resources are in fixed supply, and their present value should reflect increasing future scarcity (high future price).

A second accounting defect, widely recognized but rarely corrected, is the failure to incorporate the flow of non-marketed, directly consumed environmental services. Measured GNP does not include many services of economic (i.e., scarcity) value. As a result, measured GNP can increase as a new industry starts production, but if associated air and water pollution are serious, the total welfare derived from incremental production—the net value of goods and services produced after subtracting the loss of directly consumed environmental services—may actually decrease. Even if it is positive, the failure to charge environmental losses against incremental production distorts the measurement of welfare and obscures the need for pollution abatement.

Sustainable development is essentially an asset-management problem. One difficulty is uncertainty. We do not know for sure the future value of specific assets, as we cannot anticipate future tastes and preferences or tomorrow's technology. Thus, we cannot know the optimal rate of exploitation of fossil fuel resources and must make debatable assumptions concerning future demand, new reserves, and technological advances. We do know, however, that for practical purposes some resource conversion processes are irreversible. Thus, a river valley located in a wilderness region can be converted to producing a flow of current income from hydro-electric development. Barring siltation of the reservoir and assuming repair or replacement of physical facilities, one long-lived asset (wilderness recreation) is exchanged for another (energy). At prevailing relative prices, especially in poor countries with acute energy problems and little current market demand for wilderness recreation, the conversion may look attractive.

But as relative prices change, as they will, the energy asset cannot be exchanged back for the wilderness asset. What premium should be attached to maintaining irreplaceable natural resources?

Time is an essential aspect of sustainable development. While the composition of assets will change, especially toward increasing the stock of human capital, the purpose of development is to provide a sustained flow of goods and services. This presents a critical dilemma for developing countries caught in the poverty-environmental degradation cycle. The temptation to consume environmental and natural resource capital without replacing it with physical and human capital of equivalent or greater value is more than an accounting defect. It arises directly from acute current consumption needs because of poverty. Depleting environmental capital is aggravated, moreover, by inappropriate property rights and land tenure problems, government subsidies of destructive agricultural practices (such as pesticide subsidies and land settlement schemes on unsuitable soils), the inability of farmers with small plots to secure credit, and a host of other problems well-known in developing countries. In this regard, sound conventional development policies are indistinguishable from sustainable development policies.

The conceptual basis of sustainable development has implications for MNCs. Corporations generally have a shorter time horizon than that of society (but not necessarily governments). Current exploitation may add to corporate profits but impoverish the host country—unless the net retained value in the country through taxes, wages, reinvestment, and technology transfer exceeds the value of resource depletion, and the retained value is used to accumulate physical and human capital.

The panel convened by WRI in early 1984 provides a useful summary of the essential features of a strategy for sustainable development.[23] The first requirement is using non-renewable resources in a technically efficient fashion—for example, to increase the recoverable portion of ore deposits and fossil fuel reserves. Second is using the earnings from non-renewable resource exploitation to build the productive capacity of the country through physical and human capital investment. Third is protecting and maintaining the productivity of renewable resources—soils, forest, fisheries—for future use. Fourth is protecting and maintaining the valuable (but non-marketed) services provided directly by environmental resources, including clean air, potable water, recreation opportunities, and other amenities.

Notes:

1. For a detailed account of evolving international environmental policies, see Lynton Caldwell, International Environmental Policy (Durham, North Caroline: Duke University Press, 1984).
2. João Augusto de Araujo Castro, "Environment and Development: The Case of the Less Developed Countries," International Organization 2 (Spring 1972), p. 401.
3. Maurice Strong, "Future Directions for Environmental Policies," mimeographed paper, remarks at Organization for Economic Cooperation and Development International Conference on Environment and Economics, Paris, June 21, 1984.
4. For a case study of sophisticated financial negotiations, see William Pintz, OK Tedi: Evolution of a Third World Mining Project (London: Mining Journal Books, Ltd., 1984).
5. Isaiah Frank, Foreign Enterprise in Developing Countries: A Supplemental Paper of the Committee for Economic Development (Baltimore: Johns Hopkins Press, 1980).
6. World Environment Report 9 (October 30, 1983), p. 5.
7. Organization for Economic Cooperation and Development, Environmental Policies for the 1980s (Paris: 1980), p. 6.
8. Russell Train, "Sustainability: Conservation and Development in the Third World," The Amicus Journal 5 (Fall 1983), p. 26.
9. Robert Dorfman, "An Economist's View of Natural Resources and Environmental Problems," prepared for World Resources Institute's Conference The Global Possible, Wye, Maryland, May 2-5, 1984.
10. Development and Environment, Report and Working Papers of a Panel of Experts Convened by the Secretary General of the United Nations Conference on the Human Environment (Founex Report) (Paris: Mouton, 1972).
    For an analysis of the role of Founex and the process of involving developing countries in the Stockholm Conference, see Caldwell, International Environmental Policy.
11. Founex Report. Emphasis added.

12. Charles Pearson and Anthony Pryor, Environment: North and South (New York: John Wiley and Sons, 1978).

13. "Ecodevelopment" is a variation that stresses use of local materials and indigenous technologies, and promotes small-scale and local control.

14. A. M. Freeman, R. H. Haveman and Alan Kneese, The Economics of Environmental Policy (New York: Wiley and Sons, 1973). Jeffrey James, "Growth, Technology and the Environment in Less Developed Countries: A Survey," World Development 6 (1978), p. 937.

15. Council on Environmental Quality, Environmental Quality 1983 (Washington, D.C.: CEQ, 1984), p. 327.

16. United States Department of Commerce, "Plant and Equipment Expenditures for Pollution Abatement, 1982 and Planned 1983," Survey of Current Business 63 (June 1983), p. 24.

17. Edward Denison, "Pollution Abatement Programs: Estimates of Their Effect Upon Output per Unit of Input, 1975-1978," Survey of Current Business 59 (8), p. 58. Productivity is measured as output per unit input.

18. There are, of course, great difficulties in quantifying costs and especially benefits. For techniques see Maynard Hufschmidt et al., Environment, Natural Systems and Development: An Economic Valuation Guide (Baltimore: Johns Hopkins Press, 1983).

19. The United States is not so far removed. Consider the description by Gifford Pinchot of an Appalachian forest in the 1890s:

    . . .the area . . . was held by a number of small farmers. These people, poor as the mountain farmer is apt to be, were obliged to use without reserve all the resources of their scantily productive lands. They were therefore in the habit of cutting all trees which could be used or sold as fuel, fencing, or saw-logs. They turned their cattle into the forest, and often burned over their woodlands for the sake of the pasturage. . . Under such treatment the forest, originally of moderate quality, grew steadily worse. The more valuable species of trees were removed, and the less valuable ones remained to seed the ground and perpetuate their kind. . . At the time . . . the condition of a large part of the forest was deplorable in the extreme. Quoted by George W. Vanderbilt, New Yorker, June 11, 1984, p. 59.

20. "Externalities" is an economic term for costs to society, such as pollution, that are not borne by (are external to) the producer or consumer.

21. "World Conservation strategy," Gland, Switzerland: International Union for the Conservation of Nature, 1980.

22. A unique natural site such as the Grand Canyon produces a renewable service —recreation and aesthetic pleasure — but if flooded for hydropower the site cannot be reproduced elsewhere or at a later time.

23. Improving Environmental Cooperation: The Roles of Multinational Corporations and Developing Countries, The Report of a Panel of Business Leaders and Other Experts Convened by the World Resources Institute (Washington, D.C.: WRI, 1984).

EIA can:

- modify and improve design
- ensure efficient resource use
- enhance social aspects
- identify measures for monitoring and managing impacts
- inform decision-making
- provide justification for a proposal

Impacts vary in:

- type and nature
- magnitude
- extent
- timing
- duration
- uncertainty
- reversibility
- significance

Integration within EIA:

The process of EIA has moved towards the consideration of all effects arising from a proposal. These can include:

- biophysical
- social
- health
- economic
- risk and uncertainty

NEPA
National Environmental Policy Act
(proclaimed in 1970)
called for:

- the public statement of the environmentally significant consequences of all federal actions
- public input into project formulation
- informed decision-making

This process became known as
Environmental Impact Assessment

Evolution of EIA:

- early 1970s — initial development
- 1970s to 1980s — trend to integration
- mid to late 1980s — cumulative effects and policy integration
- mid 1990s — towards sustainability (SEA, biodiversity)

Developments in the 1990s:

- major reforms to well established systems
- implementation of EC Directive (1985)
- World Bank and other agencies introduce policies
- convention on EIA in a Transboundary Context (1991)
- conventions on Climate Change and Biological Diversity

EIA—Three core values

- sustainability — the EIA process will result in environmental safeguards
- integrity — the EIA process will conform to agreed standards
- utility — the EIA process will provide balanced, credible information for decision-making

Sadler, 1996

EIA — Eight guiding principles

- participation
- transparency
- certainty
- accountability
- credibility
- cost-effectiveness
- flexibility
- practicality

Sadler, 1996

EIA Operating Principles

EIA should be applied:

- to all development project activities likely to cause potentially significant adverse impacts or add to actual or potentially foreseeable cumulative effects
- as a primary instrument for environmental management to ensure that impacts of development are minimised, avoided or rehabilitated
- so that the scope of review is consistent with the nature of the project or activity and commensurate with the likely issues and impacts
- on the basis of well defined roles, rules and responsibilities for key actors

Sadler, 1996

EIA Operating Principles cont'd

EIA should be undertaken:

- throughout the project cycle, beginning as early as possible in the concept design phase
- with clear reference to the requirements for project authorisation and follow-up, including impact management
- consistent with the application of 'best practicable' science and mitigation technology
- in accordance with established procedures and project-specific terms of reference, including agreed timelines
- to provide meaningful public consultation with communities, groups and parties directly affected by, or with an interest in, the project and/or its environmental impacts

Sadler, 1996

EIA Operating Principles cont'd

EIA should address, wherever necessary or appropriate:

- all related and relevant factors, including social and health risks and impacts
- cumulative and long-term, large-scale effects
- design, locational and technological alternatives to the proposal being assessed
- sustainability considerations including resource productivity, assimilative capacity and biological diversity

Sadler, 1996

EIA Operating Principles cont'd

EIA should result in:

- accurate and appropriate information as to the nature, likely magnitude and significance of potential effects, risks and consequences of a proposed undertaking and alternatives to it
- the preparation of an impact statement or report that presents this information in a clear, understandable and relevant form for decision-making, including reference to qualifications, and confidence limits in the predictions made
- ongoing problem solving and conflict resolution to the extent possible during the application of the process

Sadler, 1996

EIA Operating Principles cont'd

EIA should provide the basis for:

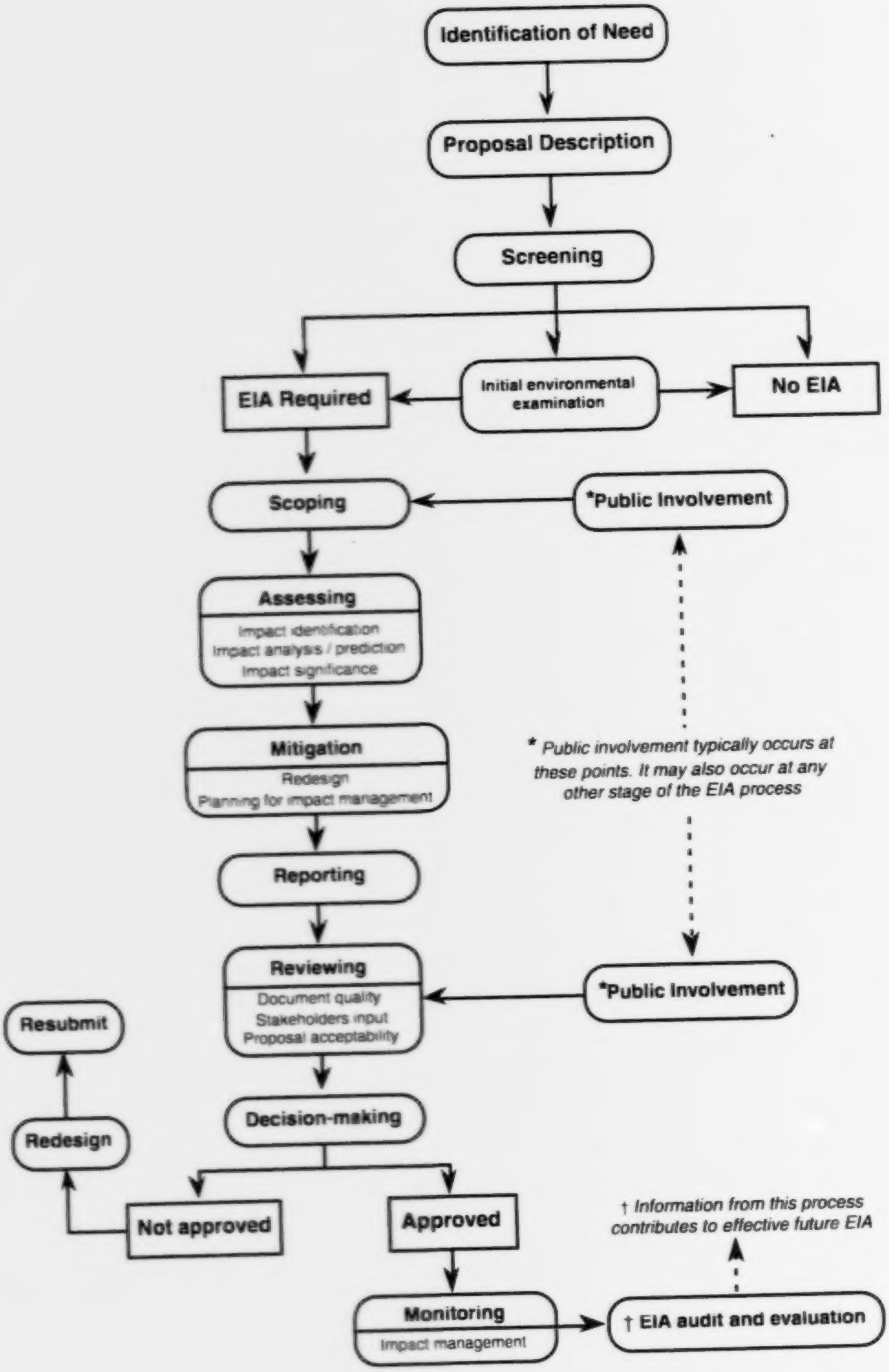
- environmentally sound decision-making in which terms and conditions are clearly specified and enforced
- the design, planning and construction of acceptable development projects that meet environmental standards and resource management objectives
- an appropriate follow-up process with requirements for monitoring, management, audit and evaluation that are based on the significance of potential effects, the uncertainty associated with prediction and mitigation, and the opportunity for making future improvements in project design or process application

Sadler, 1996

The EIA process:

- screening
- scoping
- assessing
- mitigating
- reporting
- reviewing
- decision-making
- monitoring and managing
- public involvement

The EIA process


Identification of Need

Proposal Description

Screening

EIA Required

Initial environmental examination

No EIA

Scoping

*Public Involvement

Assessing

Impact identification
Impact analysis / prediction
Impact significance

Mitigation

Redesign
Planning for impact management

* Public involvement typically occurs at these points. It may also occur at any other stage of the EIA process

Reporting

Reviewing

Document quality
Stakeholders input
Proposal acceptability

*Public Involvement

Resubmit

Redesign

Decision-making

Not approved

Approved

† Information from this process contributes to effective future EIA

Monitoring

Impact management

† EIA audit and evaluation

EIA Costs for Multipurpose Projects in Thailand

Name of project	Project cost (million baht)	EIA cost (million baht)	EIA cost as percentage of total project cost
Pattani	2737.10	3.1	0.11
Que Noi (Khao Laem)	9110.00	0.7	0.01
Chiew Larn	7035.10	3.7	0.05
Upper Quae Yai	10953.00	4.5	0.04
Nam San, Nam Man, Nam Loei	7612.00	5.3	0.07
Kud	8092.00	5.0	0.06
Lang Suan	6248.00	2.4	0.04
Ma Pong	60000.00	18.0	0.03

Source: UN ESCAP (1990)

Delays are caused during EIA when:

- the EIA is commenced too late in the project cycle
- the terms of reference are poorly drafted
- the EIA is not managed to a schedule
- the EIA report is inadequate and needs to be upgraded
- there is a lack of technical data

Benefits of EIA include:

- more environmentally sustainable design
- better compliance with standards
- savings in capital and operating costs
- reduced time and costs for approvals
- avoids later plant adaptations
- reduced health costs
- increased project acceptance

Ensuring fairness in the EIA process

- register consultants' names and terms of reference
- name consultants and their expertise in the EIA report
- publish the terms of reference in the EIA report
- make EIA reports available to the public
- publish lists of screening and final decisions along with conditions for approval

Topic 2—Law, Policy and Institutional Arrangements for EIA Systems

Objective

This topic provides insight into the existing range of EIA systems, the types of insititutional support that can be provided and the directions in which EIA is developing. It also examines the factors that need to be considered when establishing or modifying a national EIA system.

Relevance

The practice of EIA can be improved through an increased understanding of the variety of approaches to EIA systems throughout the world; and through an understanding of what can be the expected benefits of successful EIA.

Those developing or reviewing EIA systems need to be able to build on the strengths of existing procedures and to incorporate new approaches that can improve EIA as a tool for moving towards sustainability.

Timing

Two to four hours (not including training activity). Note that the length of the session will depend upon whether the ECE recommendations on pages 145 to 148 are worked through in detail.

☑ Information checklist

Obtain or develop the following, as appropriate:

- ☐ details and reviews of EIA systems used in the region;
- ☐ copies of agreements/memoranda of understanding etc that exist when more than one set of EIA requirements apply in a region or for a project. Seek out an analysis of the strengths and weaknesses of these agreements;
- ☐ information about how the EIA system manages any responsibilities that the country has under the United Nations Conventions for Biological Diversity, Transboundary Impacts, and Climate Change;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres who may be able to provide assistance and information regarding developing national EIA procedures; and
- ☐ other resources that may be available such as videos, journal articles, computer programmes, lists of speakers, case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why they are important.

This topic provides insight into the range of EIA systems, the types of institutional support that can be provided and the directions in which EIA is developing. It also examines the factors that need to be considered when establishing or modifying a national EIA system.

1 **Very briefly review the aims, structure and principles of the EIA process.**

Briefly run through the main components of the EIA process (Overhead 1-15 in Topic 1).

2 Review the main principles of EIA (Overhead 1-1 from Topic 1).

Emphasise that EIA is not a static process. Those creating an EIA system today have the opportunity to build upon the past experience of others and to move EIA closer towards a model that will support the aims of sustainability.

3 The results of the International Study of the Effectiveness of Environmental Assessment, completed in 1996, provide valuable information about the evolving nature of EIA and its strengths and weaknesses as it is currently practised in many countries throughout the world. The Effectiveness Study contains many lessons for those who are in the process of creating or modifying EIA systems, and provides information that can be used to improve systems that have already been established by others.

In particular, the Effectiveness Study notes that EIA is becoming a more integrative, multi-purpose, interdisciplinary approach to development planning and decision-making. Four trends have emerged:

- EIA systems are being reviewed and reformed to include the consideration of a greater range of factors, for example, social, risk and health issues;
- the temporal and spatial frameworks for impact analysis are being extended to include cumulative and regional scale effects, for example the Espoo Convention (UN Economic Commission for Europe [UNECE] Convention on EIA in a Transboundary Context, 1991) identifies principles and provisions for EIA of projects and activities with transboundary effects;
- development issues at the policy, plan and/or programme levels are starting to be addressed through processes such as Strategic Environmental Assessment; and

- sustainability perspectives and principles are beginning to be incorporated into EIA practice, for example, additional requirements are placed on EIA by the UN Conventions on Climate Change and Biological Diversity (1992).

The Effectiveness Study emphasises that several countries that have had long term experience in EIA as a project assessment tool have noted its inadequacies in dealing with the assessment of policies, plans and programmes. Various models of Strategic Environmental Assessment (SEA), adapted from project EIA, have emerged to meet this need. When SEA is designed to be integrated with EIA, in a form of tiered assessment and without duplication of effort, it can significantly reduce the burden on individual project EIAs (see the box below).

Box 1: Example of Tiered Environmental Assessment—Waste Management in the Netherlands

National level

- decision(s) on *technologies for final waste treatment*, eg. reuse, dumping or incineration and total treatment capacities
- SEA carried out to identify available options and assess their impacts

Regional level

- decision(s) on where treatment *sites* will be located
- SEA assesses locational options and their environmental consequence

Project level

- decisions on *design and mitigation* measures for each of the selected locations
- project EIAs are tiered to earlier assessments and decisions
- as such, they are specific, limited and to-the-point

Source: Sadler and Verheem, 1995

Broadly outline the ways in which a country can develop a national system for EIA. Provide an overview of the legislative and institutional characteristics required to support such a national system.

> *...in some countries, environmental review processes of international organizations are used as the foundations for legal and institutional requirements in decision making whereas in other countries such requirements are absent. It is thus necessary to be aware of the larger political, institutional and legal contexts within which environmental review processes are conducted such that we have realistic expectations of these processes and can avoid attributing undue credit and blame on them.*[1]

An examination of national EIA systems around the world will reveal a number of ways in which EIA procedures can be implemented and provided with institutional support. An EIA system from one country cannot be taken and implemented in another without significant adaptation to integrate it with local socio-political, institutional, economic, development, planning and pollution control systems.

Most national EIA systems are established in legislation, although guidelines are also used, often during periods during which proposed legislation can be trialed. In developing national EIA systems, policy makers need to seek a balance between the certainty created by highly legislated processes and the flexibility allowed by those that are less regulated.

There is also variation in the ways in which institutional support can be provided to EIA (this can be seen in the table below). For instance, in some countries, separate environment agencies are established whereas in others, the EIA process is administered by existing departments such as those for planning or conservation. In deciding upon an appropriate model for a country, it is necessary to plan for EIA to be institutionalised in the area where it will have the resources, and the political support, to be effective in achieving its aims.

Table 1: Features of Different EIA Systems

Country	*Main Oversight Agency*	*EIA Preparer*	*Public Participation*
Bangladesh	Ministry of Environment and Forests	Project proponent	yes
People's Republic of China	National Environmental Protection Agency at various levels (no committee review)	Project proponent	yes, but no public hearings
India	Department of Environment within the Ministry of Environment (utilises an environmental appraisal committee)	Project proponent	limited
Indonesia	BAPEDAL (Environmental Impact Management Agency) within the Ministry of the Environment (Utilises two EIA review commissions)	Project proponent	limited
Laos	If EIA conducted, Ministry of Agriculture and Forestry	Project proponent	
Malaysia	Department of Environment (DOE) within the Ministry of Science and Technology and Environment (EIA Review Committee within DOE for preliminary EIAs and an EIA ad hoc panel for detailed EIAs)	Project proponent	yes
Philippines	Environmental Management Bureau within the Department of the Environment and Natural Resources (EIS Review Committee)	Project proponent	yes, but not mandatory
Papua New Guinea	Department of Environment and Conservation within the Ministry for Environment and Conservation (no EIA Review Committee)	Project proponent	yes
Fiji	Environment Department	Project proponent	yes, because most land is private
Sri Lanka	Central Environmental Authority (no committee)	Project proponent	yes
Thailand	Office of Environmental Quality and Planning (Review Committee)	Project proponent	no
Vietnam	Ministry of Science, Technology and Environment	Project proponent	yes

Source: Welles, 1995

Discuss the problems that can be caused by the lack of coherence in environmental assessment procedures. Note that the OECD has done work to help streamline agreement on EIA requirements when more than one EIA system applies.

In many jurisdictions it can be found that more than one set of EIA procedures may apply to a proposal. The lack of coherence between the EIA requirements of various governments or agencies can lead to uncertainty, confusion and unproductive added expense for proponents. Problems commonly occur when:

- countries receive aid from a number of donors, each having its own prescribed assessment process; or
- a proposal is transboundary in nature, requiring compliance with EIA procedures in two or more countries, states or levels of constitutional hierarchy.

The problems of coherence of EIA for international bilateral aid are being addressed by the Working Party on Development Assistance and Environment, part of the Development Assistance Committee of the OECD. The report of this committee was published in 1994 (see reference list) and contains a range of recommendations, in particular:

- a framework Terms of Reference for the EIA of development assistance projects;
- a comprehensive checklist for managing EIA; and
- a summary of country policies and procedures.

Outline the factors that help to establish an effective national EIA system. Ask the participants about any implications these may have for EIA locally and if they can identify any other factors that may be relevant.

Experience has highlighted a number of features that are common determinants of a successful EIA system. Many of these are interrelated.
4 They include:

- strong EIA legislation and legal system to support it
- a sound policy basis
- a clear perception of the aims of the process and its potential benefits
- political commitment/capacity for implementation
- institutional capacity
- adequate technical capacity, data and information
- public involvement
- financial capacity
- availability/accessibility of professional expertise

Strong EIA legislation and legal system

Strong legislation can provide clear guidance on the EIA process and the responsibilities of the various participants. It needs to be framed specifically to achieve the goals or outcomes that have been identified. EIA legislation must also be flexible enough to allow for changing societal expectations and demands. If the legislation is to be implemented effectively it needs to be supported by a strong and capable legal system.

Sound policy basis

During the establishment of EIA policy the following factors should be addressed:

- the reasons for introducing EIA and the problems that it is meant to resolve;
- the goals of the EIA process and how their achievement can be measured;
- the most appropriate approaches to implementing, enforcing and monitoring the achievements of the EIA process; and
- mechanisms for reviewing and adapting the EIA process to ensure that it continues to meet needs.

Clear perception of the aims and benefits of the process

It is important for all stakeholders to have a realistic perception of the role that EIA is to play in development approvals. Also, in order to ensure continued support for the process, it is necessary that its benefits are recognized and acknowledged.

Political commitment

The process cannot succeed in its aims without political commitment, public involvement, public support and adequate resources.

Institutional capacity

EIA needs to be placed within a part of government that empowers it to perform its role in development and programme planning. Otherwise, even if there is a legislative basis for the process, its potential benefits will be greatly reduced. Care should be taken to ensure that good communication, coordination and co-operation are facilitated and encouraged between the variety of government departments responsible for development and resource management.

Technical capacity, data and information

For the continued success of a national EIA system a country needs to develop the local technical capacity to carry out, research, analyse, review and implement the outcomes of an EIA. Allied to this is the need to collect, collate and make accessible data, information and their sources.

Public involvement

While attention to technical matters is essential, there is still a need to involve the public in identifying all the issues and information that may be of importance to the future success, or viability, of a project. Many projects have failed because they did not take into account local or traditional factors or because they failed to gain public acceptance and support.

Financial capacity

Part of the political commitment to the EIA process is the provision of adequate funds to administer the process and to build capacity in the country. This commitment should include a financial commitment to training. Often there is also a need to provide funding for public involvement programmes.

In the long term, the continuation of adequate funding will depend upon the recognition of the benefits that the process has brought to both the proponents and the country. These benefits need to be recorded (such as in case studies) so that they are available for later use.

Availability/accessibility of professional expertise

Developing a strong national EIA system requires capacity building to ensure that properly qualified and trained professionals are available and accessible when required.

Outline the factors to be considered, and the steps involved, when establishing or modifying a national EIA process. Ask if any of the participants have experience in this area that they could share with the group.

EIA is intended to integrate socio-economic goals, scientific facts, societal values and eco-system considerations to provide a balanced analysis of the effects of a range of development alternatives. Increasingly EIA is being used to guide development from the outset, producing environmentally sensitive design. With this in mind, the development or modification of a country's EIA procedures requires:

- the support of government;
- 5 an understanding of the range of political, social and economic planning structures and processes within the society and their potential interaction with the EIA system, to avoid the duplication of requirements and still maintain the integrity of the EIA process;
- a broad knowledge of the different ways in which EIA can be implemented and of their relative strengths and weaknesses; and
- an understanding of the future directions for EIA.

6 There are a number of steps involved in creating an EIA process to meet the needs of a particular country. These are basically to:

- establish the goals of the EIA process;
- review a range of EIA systems adopted in other countries, especially those that are similar in nature to the country developing the national system;
- identify, and cater for, international obligations such as those arising from the Conventions on Biological Diversity, Transboundary Impacts and Climate Change;
- learn from the experience of others (consider reviews such as the Effectiveness Study);

- incorporate features that will facilitate the move towards sustainability;
- identify appropriate standards and procedures;
- develop trial guidelines to test the system in practice;
- produce the necessary legislation; and
- incorporate appropriate monitoring and review processes to ensure that EIA continues to be adapted to meet the needs of the country.

The Economic Commission for Europe (ECE) has made a number of recommendations to ECE governments for establishing EIA procedures (Box 2). If appropriate, provide a copy of these to the participants and adapt or add to them to meet the needs of the local situation.

Box 2: Principles for the Implementation of Environmental Impact Assessment

(From ECE, 1991)

It is recommended that:

1. Priority should be accorded to the implementation of EIA through legislation, which should:

(a) In the case of separate legislation, provide for linkage with other legislation which, inter alia, governs land-use planning and planning in different economic sectors, licensing and permit systems and environmental management;

(b) Provide for the analysis and evaluation of possible environmental impacts (including health impacts) of activities before a decision is taken, as well as in the construction and operation phases;

(c) Contain provisions to promote the integration of environmental considerations into planning and decision-making processes;

(d) Promote integrated environmental management in relation to sustainable economic development; and

(e) Allow for the necessary resources to be allocated to the EIA process.

2. Existing legislation and practices should be examined to ensure that EIA is fully integrated into decision-making, so that a comprehensive environmental management approach can be implemented.

3. EIA should, in principle, be applicable to a wide range of activities including urban development, agricultural and industrial development (including retrofitting into old technology) and energy generation and transportation, the development and operation of physical infrastructures, natural resources exploitation, treatment, storage and disposal of waste.

4. There should be more harmonisation of EIA practices, at the national and international levels, to unify terminology, inter alia through the development of a list of terms, to facilitate mutual understanding and to enable the undertaking of EIA in a transboundary context.

5. In each country, an authority should be identified to introduce and oversee the administration of national EIA programmes.

6. An EIA process should provide for:

(a) A clearly defined application of the process to certain activities and to specific levels of decision-making;

(b) Scoping procedures;

(c) Procedures for independent review;

(d) Public participation opportunities;

(e) Identification of mitigation measures;

(f) A linkage with decision-making including a record of decision(s);

(g) Post-project analysis and monitoring; and

(h) Institutional and organizational requirements.

7. For the sake of effectiveness and the optimum allocation of financial and human resources, EIA should particularly be applied where anticipated activities are likely to cause significant environmental impacts, in particular those with a long-term or irreversible character. Mechanisms for identification should be used, such as the enumeration of activities subject to EIA (based on, inter alia, sensitive ecosystems, vulnerable resources, non-renewable resources, specific criteria and threshold levels, or combinations of these methods) or initial environmental evaluation procedures.

8. EIA legislation should apply to individual projects and could allow for application to regional development schemes and programmes as well as general policies and strategies.

9. Depending on the nature and degree of the assessed impacts, EIA should continue during the construction, operational and decommissioning phases of activities in order to:

(a) Monitor compliance with the agreed conditions set out in construction permits and operating licences;

(b) Review environmental impacts for the proper management of risks and uncertainties;

(c) Modify the activity or develop mitigation measures in case of unpredicted harmful effects on the environment;

(d) Verify past predictions in order to transfer this experience to future activities of the same type.

10. Procedural arrangements ('scoping') should be adopted to determine the issues to be examined, as well as to develop and to select reasonable alternatives to proposed activities.

11. Scoping processes should be undertaken early in EIA by involving and consulting all parties concerned in order to avoid unnecessary cost and delay, and to accommodate early on the conflicting interests of parties involved.

12. The EIA documentation should undergo an independent review to control the quality and adequacy of the information prior to the decision being made.

13. Review procedures should be defined in relevant legal provisions, regulations or other appropriate arrangements, and be undertaken by an interdisciplinary team with the relevant expertise, in order to assure the preparation of well-balanced and complete results, to enhance the acceptability of the outcome and to improve the management of uncertainties and risks in EIA.

14. EIA procedures should allow for the direct involvement of the affected public, individuals, groups and organizations early on in the EIA process, as they can make important contributions to the identification of objectives, impacts and alternatives.

15. Programmes should be developed as early as possible in the EIA process in order to inform the public of planned activities through direct notification and the use of mass media such as newspapers, television and radio.

16. Efforts should be increased to develop or improve:

(a) Integrated monitoring programmes;

(b) Methods and programmes for the collection, analysis, storage and timely dissemination of directly comparable data regarding environmental quality in order to provide an input to EIA.

17. In order to improve the efficiency of EIA and to obtain a better understanding of its cost-effectiveness, information should be collected to determine the benefits and costs of EIA as a tool for both planning and environmental protection as well as for the integration of environmental values into the decision-making process.

18. When applicable, the consideration of alternatives should take into account different activities, options in technology, process, operation, location, mitigation and compensation measures as well as production and consumption patterns.

19. Appropriate measures should be promoted that allow for and facilitate the assessment of environmental impacts from new technological developments in all economic sectors; to this effect regulations, guidelines and criteria should be developed in order to apply the principles of EIA to technological innovations.

20. EIA documentation should contain, as a minimum:

(a) The setting of the activity (purpose and need);

(b) Which authority(ies) is (are) required to act upon the documentation, and the nature of the decision(s);

(c) Description of the activity itself and reasonable alternatives to it, if appropriate, including the do-nothing alternative;

(d) The potential environmental impacts and their significance attributable to the activity and its alternatives as well as the socio-economic consequences of environmental change owing to the activity or its alternatives;

(e) The relevant environmental data used and, for reasons of clarity, an explicit indication of predictive methods and underlying assumptions made during the assessment procedure;

(f) The identification of gaps in knowledge and uncertainties which were encountered in compiling the required information;

(g) An outline of monitoring and management programmes and mitigation measures to keep environmental degradation at a minimum; and

(h) A non-technical summary including a visual presentation (maps, graphs, etc).

21. Special consideration should be given to the setting up or intensification of specific research programmes aimed at:

(a) Improving existing qualitative and quantitative methods for assessing the environmental impacts of proposed activities;

(b) A better understanding of cause-effect relationships and their role in integrated environmental management;

(c) Analysing and monitoring the efficient implementation of such decisions with the intention of minimizing or preventing impacts on the environment (post-project analysis);

(d) The development of methods to stimulate creative approaches in the search for environmentally sound alternatives to planned activities, production and consumption patterns;

(e) The development of methodologies for the application of the principles of EIA at the macro-economic level. The results of the programmes listed above should be exchanged at the international level.

22. Education and training should be regarded as an important tool to improve the practical application and implementation of EIA:

(a) For managers (both proponents and competent authorities);

(b) For practitioners; and

(c) For students (at universities and other appropriate higher schools).

Managers and practitioners should be provided with additional training. For students, curricula should include the concept of the integrated approach of EIA. Governments should exchange information on planned EIA training courses.

23. Co-operation in the field of EIA in a transboundary context is necessary and should be developed and intensified among countries concerned, taking into account national sovereignty over natural resources, to enable:

(a) The provision of information, notification and consultation as early as possible in the EIA process and prior to decisions being taken on planned activities with potentially significant environmental effects on other countries;

(b) The exchange of relevant environmental data and information on the planned activities and their possible transboundary effects;

(c) Public participation in the affected areas based on the principles of reciprocity and non-discrimination;

(d) When appropriate, the provision of a mechanism for independent review which may involve a joint commission, joint monitoring and preparation of assessment documentation, implementation of mutually agreed mitigation measures and means to incorporate the views of the affected country(ies) into the decision-making process.

24. Governments should incorporate EIA provisions in existing and new bilateral or multilateral treaties or agreements with potential environmental implications.

7

Experience with EIA and developing EIA processes has generated the following generally applicable 'rules of thumb' that may be useful to others. Do they apply in this situation? Do the participants have any others to offer the group? Use OHP 7 to record any local 'rules of thumb'.

Rules of Thumb:

- Without a legal or policy framework, EIA becomes ad hoc and the benefits are reduced.
- EIA is assisted by other environmental policies and standards such as ambient air quality standards, discharge licensing etc.
- Models of EIA always need to be adapted to suit specific country needs, particularly in the area of public involvement.
- It is better if EIA applies equally to private and publicly funded projects.
- Building multiple stages of public involvement into the EIA process, beginning at an early stage in the project cycle, helps to defuse controversy as people don't feel that they only have one chance for input.
- The more projects subjected to EIA the more quickly the capacity for doing good EIA will build.
- Clever ways of building on experience can be devolved even if the experience has not yet been developed; eg start with checklists and matrices etc which can be refined as experience with the process grows.
- The more experience that a proponent has with EIA the more efficient the process.

- When proponents, the government and the public are experienced in the process they are more likely to have fair and reasonable expectations of the process and its outcomes.
- The identification and management of significant environmental issues through EIA can, at least when predictive capability is still growing, lead to substantial benefits.
- There need to be realistic expectations for the process in situations where there is political/social instability.
- For small countries, environmental assessment procedures may be more likely to work when they are controlled by an Environment Board or a Cabinet subcommittee rather than by a single Minister.

Include a training activity to reinforce the topic (if desired).

Summarize the presentation and preview the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Malik, M. (1995) Environmental Procedures of International Organizations—a Preliminary Evaluation. *The Environmental Professional*. vol 17 pp 93-102
2. Boyle, J. and Mubvami, T. (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe*. Department of Natural Resources, Ministry of Environment and Tourism. Zimbabwe

Bisset, R. (1996) *EIA: Issues, Trends and Practice*. The Environment and Economics Unit UNEP. Nairobi

ECE (1991) *Policies and Systems of Environmental Impact Assessment*. United Nations. New York

OECD/DAC (1994) *Towards Coherence in Environmental Assessment: Results of the Project on Coherence of Environmental Assessment for International Bilateral Aid*. vols 1, 2 and 3. Canada

Sadler, B. and Verheem, R. (1995) *Strategic Environmental Assessment—Status, Challenges and Future Directions*. The Hague: forthcoming.

Welles, H. (1995) EIA Capacity-Strengthening in Asia. The USAID/WRI Model. *The Environmental Professional*. vol 17 pp 103-116

Further reading

Bregha, F., Benidickson, J., Gamble, D., Shillington, T. and Weick, E. (1990) *The Integration of Environmental Considerations into Government Policy*. Canadian Environmental Assessment Research Council. Quebec

Dovers, S. (1995) Information, Sustainability and Policy. *Australian Journal of Environmental Management*. vol 2 pp 142-156

Jacobs, P. and Sadler, B. (undated) *Sustainable Development and Environmental Assessment: Perspectives on Planning for a Common Future*. Canadian Environmental Assessment Research Council. Quebec

Lee, N., and Walsh, F. (1992) Strategic Environmental Assessment: An Overview, *Project Appraisal* 7(3) pp 126-136

Rees, W. E. (1988) A Role for Environmental Assessment in Achieving Sustainable Development. *Environmental Impact Assessment Review* pp 273-291

Robinson, N. A. (1993) EIA Abroad: The Comparative and Transnational Experience. In, *Environmental Analysis: The NEPA Experience*. ed. Hildebrand, S. G. and Cannon, B. J. Lewis Publishers. Florida

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Spaling, H. and Smit, B. (1993) Cumulative Environmental Change: Conceptual Frameworks, Evaluation Approaches and Institutional Perspectives. *Environmental Management*. 17(5), pp 587-600

Wood, C. and Dejeddour, M. (1992) Strategic Environmental Assessment: EA of Policies, Plans and Programmes. *Impact Assessment Bulletin* 10(1): pp 3-22

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

2–1 What would be the most effective way of implementing a national system of environmental impact assessment? Through a permitting system, through a land-use planning process or another method?

2–2 How should EIA be administered nationally if the full potential of the process is to be achieved?

2–3 How can EIA be developed so that it addresses the broader needs of policies, plans and programmes?

2–4 Identify some simple strategies that could be used to increase the consideration of environmental factors in policy making.

2–5 How could the local EIA process be adapted to encourage the consideration of cumulative impacts? What information or other resources might be needed to implement these improvements?

2–6 What are the advantages and disadvantages of using discretionary versus prescriptive procedures for the various stages of the EIA process.

2–7 What are the main challenges in implementing an environmental policy for sustainability?

Speaker themes

2–1 Invite a speaker to discuss the harmonisation of EIA policies for the donors involved in development.

2–2 Invite a speaker who has been involved in the successful implementation of EIA procedures under similar conditions to discuss the manner in which this was done.

2–3 Invite a speaker to outline the way in which a strategic environmental assessment was used to establish the priorities for a range of projects.

Group Activity 2-1: Law, Policy And Institutional Arrangements

Title	**Tiering**
Aim	To explore the nature of EIA in a tiering context
Group size	Two or three people in each group, concluding with a whole group discussion.
Duration	Two hours

Resources required

- A copy of a local EIA for each group

Description of activity

- Identify any issues from the project EIA that could have been better handled at higher order levels of decision-making.
- If a tiered approach to the approval had been taken, how might the nature of the development have been changed?
- Small groups report their findings to the whole group for discussion.

Group Activity 2-2: Law, Policy And Institutional Arrangements

---

Title	**Using Strategic Environmental Assessment (SEA)**[2]
Aim	To expose the participants to problem solving at a policy level.
Group size	Two or three people in each group, concluding with a large group discussion.
Duration	Three hours

Resources required

- Some reference material relating to sources of electrical energy, costs, availability etc.

Description of activity

You have been asked to undertake a Strategic Environmental Assessment of different options for increasing the availability of electrical energy in your country:

- What options should be considered?
- What are the significant environmental effects associated with each option?
- Based on a listing of these effects, should any of the options be ruled out on environmental grounds?
- Are there effects which require more specific study before policy choices can be made among the remaining options?
- What types of issues would need to be addressed in individual project EIAs under each remaining option?

---

1 & 2

Identical to 1–15

Identical to 1–1

3

EIA trends as identified by the Effectiveness Study:

- EIA systems now include a greater range of factors: social, risk , health etc
- temporal and spatial boundaries are being extended to include cumulative and regional scale effects
- policy, plan and programme level decisions are starting to be addressed through SEA
- sustainability perspectives and principles are beginning to be incorporated

4

Achieving strong EIA requires:

- strong legislation and legal system
- a sound policy basis
- a clear perception of the aims of the process and its potential benefits
- political commitment
- institutional capacity
- adequate technical capacity, data and information
- public involvement
- financial capacity
- professional expertise

5

Developing EIA procedures requires:

- the support of government
- understanding of political, social, economic and planning processes
- knowledge of the range of ways in which EIA can be implemented
- understanding of the future directions for EIA

6

Steps to developing an EIA system:

- establish goals
- review other EIA systems
- identify obligations under Treaties
- learn from the experience of others
- incorporate features to move towards sustainability
- identify procedures and standards
- develop trial guidelines
- produce legislation
- incorporate processes for monitoring and review

7

EIA Systems — Local rules of thumb

To be used to make up a list of local rules of thumb

The Economic Commission for Europe (ECE) has made a number of recommendations to ECE governments for establishing EIA procedures.

Principles for the Implementation of Environmental Impact Assessment

It is recommended that:

1. Priority should be accorded to the implementation of EIA through legislation, which should:

(a) In the case of separate legislation, provide for linkage with other legislation which, inter alia, governs land-use planning and planning in different economic sectors, licensing and permit systems and environmental management;

(b) Provide for the analysis and evaluation of possible environmental impacts (including health impacts) of activities before a decision is taken, as well as in the construction and operation phases;

(c) Contain provisions to promote the integration of environmental considerations into planning and decision-making processes;

(d) Promote integrated environmental management in relation to sustainable economic development; and

(e) Allow for the necessary resources to be allocated to the EIA process.

2. Existing legislation and practices should be examined to ensure that EIA is fully integrated into decision-making, so that a comprehensive environmental management approach can be implemented.

3. EIA should, in principle, be applicable to a wide range of activities including urban development, agricultural and industrial development (including retrofitting into old technology) and energy generation and transportation, the development and operation of physical infrastructures, natural resources exploitation, treatment, storage and disposal of waste.

4. There should be more harmonisation of EIA practices, at the national and international levels to unify terminology, inter alia through the development of a list of terms, to facilitate mutual understanding and to enable the undertaking of EIA in a transboundary context.

5. In each country, an authority should be identified to introduce and oversee the administration of national EIA programmes.

6. An EIA process should provide for:

(a) A clearly defined application of the process to certain activities and to specific levels of decision-making;

(b) Scoping procedures;

(c) Procedures for independent review;

(d) Public participation opportunities;

(e) Identification of mitigation measures;

(f) A linkage with decision-making including a record of decision(s);

(g) Post-project analysis and monitoring; and

(h) Institutional and organizational requirements.

7. For the sake of effectiveness and the optimum allocation of financial and human resources, EIA should particularly be applied where anticipated activities are likely to cause significant environmental impacts, in particular those with a long-term or irreversible character. Mechanisms for identification should be used, such as the enumeration of activities subject to EIA (based on, inter alia, sensitive ecosystems, vulnerable resources, non-renewable resources, specific criteria and threshold levels, or combinations of these methods) or initial environmental evaluation procedures.

8. EIA legislation should apply to individual projects and could allow for application to regional development schemes and programmes as well as general policies and strategies.

9. Depending on the nature and degree of the assessed impacts, EIA should continue during the construction, operational and decommissioning phases of activities in order to:

(a) Monitor compliance with the agreed conditions set out in construction permits and operating licences;

(b) Review environmental impacts for the proper management of risks and uncertainties;

(c) Modify the activity or develop mitigation measures in case of unpredicted harmful effects on the environment;

(d) Verify past predictions in order to transfer this experience to future activities of the same type.

10. Procedural arrangements ('scoping') should be adopted to determine the issues to be examined, as well as to develop and to select reasonable alternatives to proposed activities.

11. Scoping processes should be undertaken early in EIA by involving and consulting all parties concerned in order to avoid unnecessary cost and delay, and to accommodate early on the conflicting interests of parties involved.

12. The EIA documentation should undergo an independent review to control the quality and adequacy of the information prior to the decision being made.

13. Review procedures should be defined in relevant legal provisions, regulations or other appropriate arrangements, and be undertaken by an interdisciplinary team with the relevant expertise, in order to assure the preparation of well-balanced and complete results, to enhance the acceptability of the outcome and to improve the management of uncertainties and risks in EIA.

14. EIA procedures should allow for the direct involvement of the affected public, individuals, groups and organizations early on in the EIA process, as they can make important contributions to the identification of objectives, impacts and alternatives.

15. Programmes should be developed as early as possible in the EIA process in order to inform the public of planned activities through direct notification and the use of mass media such as newspapers, television and radio.

16. Efforts should be increased to develop or improve:

(a) Integrated monitoring programmes;

(b) Methods and programmes for the collection, analysis, storage and timely dissemination of directly comparable data regarding environmental quality in order to provide an input to EIA.

17. In order to improve the efficiency of EIA and to obtain a better understanding of its cost-effectiveness, information should be collected to determine the benefits and costs of EIA as a tool for both planning and environmental protection as well as for the integration of environmental values into the decision-making process.

18. When applicable, the consideration of alternatives should take into account different activities, options in technology, process, operation, location, mitigation and compensation measures as well as production and consumption patterns.

19. Appropriate measures should be promoted that allow for and facilitate the assessment of environmental impacts from new technological developments in all economic sectors; to this effect regulations, guidelines and criteria should be developed in order to apply the principles of EIA to technological innovations.

20. EIA documentation should contain, as a minimum:

(a) The setting of the activity (purpose and need);

(b) Which authority(ies) is (are) required to act upon the documentation, and the nature of the decision(s);

(c) Description of the activity itself and reasonable alternatives to it, if appropriate, including the do-nothing alternative;

(d) The potential environmental impacts and their significance attributable to the activity and its alternatives as well as the socio-economic consequences of environmental change owing to the activity or its alternatives;

(e) The relevant environmental data used and, for reasons of clarity, an explicit indication of predictive methods and underlying assumptions made during the assessment procedure;

(f) The identification of gaps in knowledge and uncertainties which were encountered in compiling the required information;

(g) An outline of monitoring and management programmes and mitigation measures to keep environmental degradation at a minimum; and

(h) A non-technical summary including a visual presentation (maps, graphs, etc).

21. Special consideration should be given to the setting up or intensification of specific research programmes aimed at:

(a) Improving existing qualitative and quantitative methods for assessing the environmental impacts of proposed activities;

(b) A better understanding of cause-effect relationships and their role in integrated environmental management;

(c) Analysing and monitoring the efficient implementation of such decisions with the intention of minimizing or preventing impacts on the environment (post-project analysis);

(d) The development of methods to stimulate creative approaches in the search for environmentally sound alternatives to planned activities, production and consumption patterns;

(e) The development of methodologies for the application of the principles of EIA at the macro-economic level. The results of the programmes listed above should be exchanged at the international level.

22. Education and training should be regarded as an important tool to improve the practical application and implementation of EIA:

(a) For managers (both proponents and competent authorities);

(b) For practitioners; and

(c) For students (at universities and other appropriate higher schools).

Managers and practitioners should be provided with additional training. For students, curricula should include the concept of the integrated approach of EIA. Governments should exchange information on planned EIA training courses.

23. Co-operation in the field of EIA in a transboundary context is necessary and should be developed and intensified among countries concerned, taking into account national sovereignty over natural resources, to enable:

(a) The provision of information, notification and consultation as early as possible in the EIA process and prior to decisions being taken on planned activities with potentially significant environmental effects on other countries;

(b) The exchange of relevant environmental data and information on the planned activities and their possible transboundary effects;

(c) Public participation in the affected areas based on the principles of reciprocity and non-discrimination;

(d) When appropriate, the provision of a mechanism for independent review which may involve a joint commission, joint monitoring and preparation of assessment documentation, implementation of mutually agreed mitigation measures and means to incorporate the views of the affected country(ies) into the decision-making process.

24. Governments should incorporate EIA provisions in existing and new bilateral or multilateral treaties or agreements with potential environmental implications.

(From ECE, 1991)

Criteria for choice of EIA process

Effectiveness criteria, involving the likelihood of the EIA procedures achieving their stated goals:

Information. The availability of a sufficient information base to allow effective design and implementation (impinges on all other criteria).

Dependability. The extent to which one can be sure that the EIA procedures will achieve the desired outcome or specified goal under existing conditions.

Timing. The time required for the EIA procedures to take effect, in relation to the time perceived available for redressing the problems.

Adaptability. The ability of the EIA procedures to be applied in the face of heterogeneity within one time period.

Flexibility. The degree to which the EIA procedures will continue to be effective, or will require modification, in the face of changing social or economic circumstances.

Cost. The gross demand on economic resources for implementation of the EIA procedures.

Efficiency. The EIA procedures that can realise the policy goal for the least possible cost. Efficiency is differentiated from cost by the consideration of the achievement of the policy goal, thus moving beyond simple expense.

Cross-sectoral influence. The potential for the EIA procedures to offer other benefits (economic efficiency, equity, human health, etc) aside from the achievement of the environmental policy goal. Conversely, the degree of surety that the EIA procedures do not entail a risk of disbenefits in such terms.

Implementation criteria, involving the likelihood of being able to implement the favoured EIA procedures in the relevant social and institutional operating environment.

Equity. The distributional implications; who bears what costs associated with the changes brought about by the application of the EIA procedures.

Political feasibility. The likelihood that the EIA procedures will be acceptable to major political/interest groups and the wider electorate.

Institutional feasibility. The ability of the existing of realistically envisaged institutional arrangements to implement the EIA procedures.

Monitoring. Whether monitoring the impact and use of the EIA procedures over time is feasible and/or affordable.

Enforcement/availability. Consequent on monitoring, whether adherence can be enforced if that is necessary and/or appropriate.

Communicability. Can the particular details of the EIA procedure, and the reasons for its use, be adequately communicated to those involved in its implementation or upon whom it will impact.

(Adapted from Dovers, 1995)

ENVIRONMENTAL IMPACT ASSESSMENT: MAKING IT WORK IN DEVELOPING COUNTRIES

Fola S. Ebisemiju

Journal of Environmental Management (1993) Vol 38 (4), pp 247-273

Progress in adopting EIA as an environmental management tool has been extremely slow in developing countries, with only nine of the 121 countries having established frameworks for its implementation. Even in these few countries, after more than a decade of EIA implementation, the performance of EIA has been dismally poor in spite of considerable efforts, especially in the Asian and Pacific region, devoted to the development of cost-effective EIA methods and techniques. This poor performance is attributed to serious flaws in their legislative, administrative, institutional and procedural frameworks. These are discussed and illustrated with specific examples. Suggestions for improvement include the use of a legislative rather than an administrative option to establish authority for EIA; establishment of an independent environmental agency with considerable political influence over sectoral agencies through placement in the office of the President or Prime Minister or a high-profile ministry with responsibility for national economic planning and budgetary control; the decentralization of EIA activities among tiers of government or sectoral agencies; mandatory involvement of the local people, the public and concerned agencies in scoping, reviewing, monitoring and auditing; a procedural arrangement characterized by two-stage assessment, mandatory scoping and preparation of terms of reference, use of registered consultants for EIA studies, provision for public hearings and time limits for review, and the conduct of EIA as a fully-internalized element of the planning process rather than a separate exercise divorced from the technical and economic aspects of project planning and design. EIA guidelines should contain these conditions and there should be adequate provision for judicial involvement in reviewing the actions of environmental agencies and project proponents.

Keywords: environmental impact assessment, developing countries, project planning and design, performance outcome of EIA frameworks.

1. INTRODUCTION

Environmental impact assessment (EIA) emerged as a response to the concerns expressed by the environmental movements of the 1960s about the serious effects of human activities, especially pollution by industries, with which existing planning regulations and pollution control measures could not adequately cope. Since its introduction in the United States of America in 1969, with the passage of the National Environmental Protection Act which requires the preparation of environmental impact statements (EIS) for "major federal actions significantly affecting the quality of the human environment", EIA has been of great interest in virtually all the industrialized nations of the world, where it has now become a major tool for environmentally-sound management practices and for the attainment of sustainable development goals.

However, progress in adopting EIA as an environmental management tool has been extremely slow in the developing countries. Although these countries have always had general environment-related laws and regulations which can be exploited for EIA purposes, these have had very limited impacts as environmental protection measures because of serious technical, administrative and political constraints (Giliomee, 1980; Abel and Stocking, 1981; Leonard and Morell, 1981; Geoghegan, 1985; Leonard, 1985; Tolentino, 1986; Gamman and McCreary, 1988; Ebisemiju, in press); in fact, only a few developing countries have used them to demand EIA. Many developing countries also have EIA legislations, but only 19 out of the 121 Sovereign Third World Countries are known to have put in place the necessary administrative, institutional and procedural frameworks for EIA implementation (Table 1).

Table 1. EIA status in developing countries

Region	Total number of countries	Countries with EIA systems*
Africa	52	–
Asia and Pacific	24	12
Caribbean	11	–
Latin America	20	7
Middle East	14	–
Total	**121**	**19**

* *See Table 2 for their names*

Various writers have commented on the slow pace at which EIA is being adopted in the developing countries. Most of the comments have focused primarily on the technical barriers to EIA implementation. These have been identified as including unfamiliarity with the EIA concept itself and its role in the planning process, unfamiliarity with EIA methodologies and techniques, shortage of indigenous staff with experience in the science of environmental assessment and lack of baseline data and the appropriate technology for EIA (Adams,1982; Sammy and Canter, 1984; Ahmad and Sammy, 1985; Wandesford-Smith et al., 1985; Biswas and Qu Geping,1987). However, even in the few developing countries with more than a decade of EIA experimentation and implementation, the gap between the intent and the performance of EIA still remains large (Abel and Stocking, 1981; Evans, 1982; Lim, 1985; Roque, 1985; Levy, 1987; Zi, 1987; Htun, 1988; Moreira, 1988; Ning and Whitney, 1988; Lin Lewis,1989). This failure is in spite of the considerable attention paid by these countries, as well as a number of bilateral and multilateral development aid agencies, to the development of simple cost-effective EIA methodologies and techniques (Suriyakumaran, 1980; AIT, 1982; ERL, 1987).

It is argued that the slow pace at which EIA is being adopted in developing countries is attributable to the absence of an enabling environment for EIA in Third World countries; this absence is analysed and discussed elsewhere (Ebisemiju, 1991; see also Renard, 1987; Towle, 1987). As regarding the observed and documented gap between the intent and performance of EIA in the few developing countries where the system has been institutionalized, it is here argued that this gap is due more to legislative, administrative, institutional and procedural deficiencies in their EIA systems than to the technical issues widely discussed in the literature, and on which workshops and conferences have focused for much of the last decade. The primary objective of this paper is to discuss these non-technical constraints with reference to specific examples, and to proffer some solutions that are feasible within the socio-cultural, political and economic realities of Third World countries. A clear understanding of these issues will no doubt prove invaluable to the many developing countries, especially in Africa and the Caribbean, which are presently in the process of introducing EIA into their planning systems.

2. THE GOALS OF EIA

Most definitions of EIA clearly portray it primarily as a tool for predicting, assessing, estimating and communicating the environmental effects of proposed policies, plans and projects (Munn, 1979). Consequently, efforts to stimulate EIA in developing countries have focused mainly on EIA as a tool for environmental analysis (Ahmad and Sammy, 1985; Biswas and Qu Geping, 1987; UNEP, 1988). However, analysis of environmental effects is not enough; the results of the analysis must be incorporated early enough in the project cycle to influence planning and design, the decision to go ahead with the project or not and the implementation and management of the project, and, unless the results of the analysis play a part in decision-making, the effort is undoubtedly in vain. In order to ensure that developments enhance the productivity of environmental systems, and that this is achieved on a sustainable basis with minimal environmental damage, EIA must not be a technical exercise divorced from the very process of project design and implementation; rather it must be seen and used not only as a tool for the analysis of environmental effects, but, more importantly, as a procedure for bringing the findings of the analysis to bear on policies, plans and investment decisions. It cannot be overemphasized that EIA is not a decision-making process per se; decision-making in the multi-disciplinary arena of environmental resource planning, development and management is by governments. EIA is merely a tool and procedure designed to ensure that adequate environmental considerations enter into the decision-making process. EIA, therefore, is a tool for shaping policies, programmes and project decisions. Its effectiveness in this regard depends not on the robustness of the methodologies and techniques of environmental assessment, but primarily on the effectiveness of the option used for introducing EIA, as well as the institutional and procedural frameworks which are established for its implementation.

3. OPTIONS FOR INTRODUCING EIA

Two options are available for introducing EIA into the planning process—legislative and administrative. The administrative option is usually in the form of a cabinet decision, as in Canada and Japan, or a policy statement contained in development plans, national conservation strategies or environmental action plans, as in a number of developing countries. For example, the Guidelines on Nigeria's Fourth National Development Plan (1981-1985) contained a directive that feasibility studies for all projects, both private and government, shall be accompanied by an environmental impact statement. The onus for the preparation of the EIS will be on the owners of the project" (Federal Republic of Nigeria, 1981). Also, one of the three main mechanisms for the implementation of the country's national policy on the environment launched in 1989 is "prior environmental assessment of proposed activities which may affect the environment or the use of a natural resource" (FEPA, 1989).

Such policy statements are more or less expressions of government concern for environmental degradation and the need for resource conservation and environmental protection. More often than not, they are made not out of conviction about the utility of the EIA system or an understanding of its mechanisms, but more in response to pressures from donor agencies. They also serve as mere lip service to national commitments to certain international conventions and laws dealing with the conservation of resources and preservation of environmental quality for sustainable development. Consequently, they are not backed up by appropriate and effective administrative or legislative actions capable of translating the policy statements into concrete executable actions. Thus, for example, a decade after the policy statement on EIA was made in Nigeria's Fourth National Development Plan, the government admitted in the preamble to the National Policy on the

Environment that environmental issues "had been neglected or not given sufficient attention ... in actions designed to increase the productivity of the society and to meet essential needs" (FEPA, 1989).

Although such policy statements are not directives as such, they have the advantage of placing environmental issues on government's agenda, creating awareness in the public and private sectors of the economy of the need for and usefulness of the EIA system, and providing some form of "legitimacy" for the consciousness-raising activities of environment-related non-governmental organizations, as well as the voluntary actions of project proponents in conducting environmental assessments.

Although cabinet decisions are also administrative directives, they have more compelling force than policy statements. A major weakness of the administrative option is that EIA is not legally enforceable. Administrative guidance also generally lacks laid down guidelines and procedures. State, provincial and local authorities and government lead agencies, therefore, have considerable freedom to determine what form their EIA guidelines and procedures should take. Consequently, the EIA system in a country is likely to be characterized by a heterogenous jumble of decisions, directives, laws and guidelines, as in Japan and Canada. Because environmental degradation is not a respecter of political or administrative boundaries, such non-uniformity in EIA implementation is capable of compounding environmental problems.

An overwhelming majority of developing countries with EIA systems have followed the footsteps of the U.S.A. by employing the legislative option whereby specific laws or decrees are enacted to make EIA mandatory (Table 2). The legislative option is a clear and unambiguous reflection of government's commitment to strong reformist measures and determination to ensure and enforce consideration of environmental matters in the decision-making process. It is a particularly desirable option in Third World countries with a low level of awareness of the environmental hazards of modern large-scale development projects, political instability, intense promotion of ethnic rather than national interests, pervasive corruption and abuse of power. The implementation of environment-related laws and regulations in developing countries has been significantly inhibited also by lack of political will on the part of government. By imbuing environmental policies with force and legitimacy, and establishing a legally-binding set of guidelines and institutional and procedural frameworks, the legislative option not only forces the hands of reluctant governments, but, more importantly, makes it politically easier for environmentally-conscious governments and bureaucratic "heroes" to give environmental considerations adequate weight in the decision-making process. It also permits both the government and the general public. including NGOs, to insist on EIA for proposed actions and to challenge decisions which are patently wrong, biased or environmentally unsound. The mere threat of having to do an EIA by law also stimulates government agencies, project proponents and consultants into a more rational mode of operation.

It is true that nothing prevents military dictatorships which routinely suspend constitutions from putting an existing environmental law "in the cooler". EIA, as practised in developed countries, exposes government policies and actions to public scrutiny and debate through public participation in reviews and litigation. For reasons of political expediency, very few governments in Third World countries would welcome public debate of the environmental implications of their policies, plans and projects, no matter how interested they may be in certain aspects of environmental protection. It is significant to note, therefore, that, although most developing countries with EIA systems opted for the legislative option, there is general lack of judicial involvement in reviewing the actions of environmental agencies and project proponents. This is a cautious strategy to prevent delays in project implementation arising from prolonged litigation, as occurred in the early stages of the implementation of NEPA in the U.S. It can, however, be faulted on the ground that, as Horberry (1984) has rightly observed, "EIA is open to capture by powerful government interests if there are no opportunities to review or challenge the analysis and assessment. Scientists can be biased, the analysis can be skewed to favour a desired result, and the results can be presented in order to favour a prior decision". These unscientific and unprofessional practices thrive best in socio-political systems in which corruption, ethnicism and dictatorship are hallmarks.

If EIA is to be effective in developing countries as an environmental protection strategy, therefore, legislative rather than administrative measures should be taken to introduce the system and implement its guidelines and procedures. Laws must not only establish the authority for the EIA system, they must specify the areas and types of projects and actions that require EIA and the powers of the environmental agency and the general public, and make judicial involvement in the review of decisions and actions mandatory. These requirements bring up the need for the intensification of training in environmental law as an important component of a country's capacity building for environmental assessment.

4. INSTITUTIONAL ARRANGEMENTS

Institutional arrangements deal with the type and effectiveness of the agency responsible for the management of the EIA system, its relationships to focal points in government, especially the sectoral or lead agencies, the mechanisms for co-ordination and cooperation among all agencies and the nature and extent of involvement of actors in the EIA process.

Since the 1972 Stockholm Conference on the Human Environment, developing countries have created a number of administrative bodies and institutional arrangements to promote environmental management objectives (Lohani, 1985; Lowry and Carpenter, 1985). The administrative and institutional measures vary from country to country, as well as over time in a given country, and can be categorized into four main groups:

1. adding environmental responsibilities to existing sectoral agencies, especially the productive or environment-related agencies such as the Ministry of Agriculture, Ministry of Works, Ministry of Mines, etc.;
2. creation of environmental units or departments within sectoral agencies,
3. establishment of a central environmental agency in the form of either an interagency committee, a subsidiary part of a ministry or an independent body placed in the office of the President or Prime Minister as an integral part of the national economic-planning body; and
4. creation of a Ministry of the Environment.

Analysis of the relative efficiency of these institutional arrangements by Ibarra (1987) and Szekely (1987) suggests that the most effective framework is the placement of the agency within the office of the President or Prime Minister, or in a very-high-profile ministry with responsibility for national economic planning and budgetary control (Tables 3 and 4). This high-profile arrangement places the agency in a strong position to exercise its controlling, supervisory and co-ordinating roles in environmental matters, and guarantees adequate funding for its operations. It is also most desirable because of the multi-sectoral character of the EIA process.

Table 2: Legislation and environmental agencies for EIA in developing countries

Country	Legislation	Environmental agency
Argentina	In preparation	National Directorate of Environmental Planning (DNOA), 1975
Bangladesh	—	Environmental Pollution Control Board
Brazil	National Environmental Policy Law, 1982; CONAMA Resolution 001, 1986	The Special Environmental Agency (SEMA), 1982
China	Environmental Protection Law, 1979	Environment Protection Bureau (1979-1987) Environmental Protection Authority, 1987
Columbia	National Code of Renewable Natural Resources & Protection of the Environment , 1974	National Institute of Renewable Resources and the Environment (INDERENA), 1968
India	Environment (Protection) Act No. 29. 1986	Department of the Environment (DOE)
Indonesia	Environmental Management Law, 1982, Regulation PP No. 29,1986	Ministry of Population and the Environment
Republic of Korea	Environmental Conservation Law, 1977,1979,1981,1982, 1983,1986	Office of the Environment (OOE)
Malaysia	Environmental Quality Act, 1974,1985	Department of the Environment (DOE), 1974
Mexico	Law of Public Works, 1980; Federal Law of Environment Protection, 1982	Ministry of Urban Development and Ecology (SEDUE)
Nepal	—	Environmental Impact Study Project (EISP)
Pakistan	Environmental Protection Ordinance No. XXXVII, 1983	Environmental Protection and Improvement Agency
Papua New Guinea	Environmental Planning Act, 1978	Department of Environment and Conservation, 1978
Peru	—	National Office for Natural Resources Evaluation (ONERN), 1962
Philippines	Presidential Decrees, 1211 and 1151(1977),1586(1978); Proclamation No. 1 179(1981)	National Environmental Protection Council (NEPC), 1977
Sri Lanka	National Environmental Acts, 1980,1984,1986	National Environmental Authority
Thailand	Improvement and Conservation of National Environmental Quality Acts, 1975, 1978	National Environmental Board (NEB)
Uruguay	—	National Institute for Environmental Preservation (INPMA), 1971
Venezuela	Organic Law of the Environment, 1976	Ministry of Environment and Renewable Natural Resources (MARN), 1976

Most environmental agencies in developing countries are subsidiary parts of one ministry or another (Table 2). They are invariably circumscribed because of their low status in the bureaucracy, underfunding and inadequacy of skilled staff and facilities. They lack political "clout", authority and legal power to enforce compliance with environmental laws and regulations. For example, when the National Environmental Board was created in Thailand in 1975, it was placed in the office of the Prime Minister, where it wielded considerable power and influence by working alongside the extremely powerful National Economic and Social Development Board. Ever since it was moved out of the Prime Minister's Office to the Ministry of Science, Technology and Energy in 1979 (Figure 1), NEB has been encountering difficulties in co-ordinating and communicating with lead agencies and state enterprises.

Also, in Korea, the Office of the Environment, which occupies a sub-ministerial position in governmental hierarchy by its placement under the Ministry of Health and Social Welfare, is overshadowed by the lead agencies which more often than not set aside its recommendations with impunity.

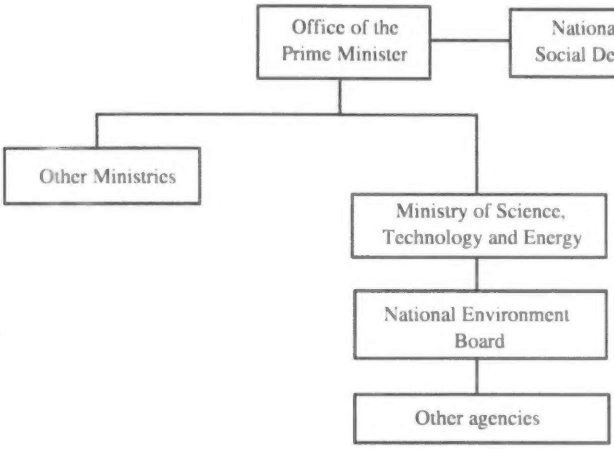

Office of the Prime Minister
National Economic and Social Development Board
Other Ministries
Ministry of Science, Technology and Energy
National Environment Board
Other agencies

Figure 1: Organizational chart for natural systems management in Thailand. Source: Lowry and Carpenter (1985).

Table 3: Effectiveness of environment policy implementation

	Implementation mechanisms					
	Operations		Regulations		Co-ordinated action	
	Allocation of own resources for investment in environmental projects	Capacity to influence allocation of investment	Application of legislation	Environ-mental impact assessment	Private sector	NGOs/ public sector
Independent units in Environment Ministry	1	4	1	1	3	2
Units in productive ministries: agriculture, tourism, etc.	3	4	3	4	4	4
Units in urban development or Housing Ministry	2	3	3	2	3	3
Units in social sector: health	4	4	1	4	4	2
Units in politically high-profile ministries: Interior, Planning	4	1	2	1	1	1
Intersectoral executive commissions	4	1	2	2	1	1

Note: rating scale: 1 = effective; 2 = limited; 3 = nominal; 4 = ineffective.
Source: Ibarra (1987)

Placement of an environmental agency in a high-profile ministry or office of the President or Prime Minister, however, does not automatically guarantee its effectiveness and efficiency. Also important is the degree of inter-organizational co-ordination and co-operation it is able to muster among the many sectoral agencies and tiers of government with responsibility for one aspect of the environment or another. This cooperation depends on the extent to which the institutional arrangement provides for and encourages such co-ordination and interagency co-operation in the EIA process. In this regard, institutional frameworks fall into two broad categories, viz. centralized and decentralized (Lim, 1985). A centralized institutional arrangement is one in which all EIA activities (Figure 2) are concentrated in either the central environmental agency, as in Mexico, or in a lead agency, as in Korea (Table 5). The decentralized model is one in which roles in the EIA process are shared among either various tiers of government (hierarchical decentralization), as in Brazil and China, or among lead agencies (functional decentralization), as in The Philippines, Thailand and Malaysia (Table 5).

No single model is universally ideal because of differences in the system of' government and the placement of environment-related responsibilities in the concurrent or exclusive list. However, if EIA is to achieve its primary objective of the incorporation of environmental considerations into project planning, design and implementation through the disclosure of environmental effects and public scrutiny, then all concerned agencies, tiers of government and the public must be involved in the EIA process. Complete centralization of EIA activities in the environmental agency is not desirable. This is because there are many sectoral agencies with responsibilities for one aspect of the environment or another. Also, the scope of environmental management is so broad that its implementation cannot be concentrated in a single agency. Moreover, each lead agency is better structured and has more appropriate personnel to implement EIA. State and local authorities also possess greater ability to influence the local environment than central governments.

It is suggested, therefore, that EIA responsibilities and roles should be functionally decentralized in countries with unitary systems of government, and hierarchically decentralized in federations where regional offices of the central environmental agency should also be established to assist state and local environmental bodies supervise, coordinate and monitor within specific geographical areas such as drainage basins, and act as links between the central and state/local environmental agencies. Environmental units should also be established in each sectoral agency, as in The Philippines, to help their respective agencies meet the national environmental policy guidelines, and assist project proponents in the processing and evaluation of environmental impact statements. Concerned agencies should be involved in scoping, review, monitoring and post-project evaluation of those aspects of the project that touch on the segments of the environment that are of concern to them. This watchdog role ensures interagency co-operation and effective EIS implementation.

Thus, although the Department of the Environment occupies a sub-ministerial status in governmental hierarchy in Malaysia (Figure 3), and functions under a federal system of government where states and local governments do not have their own environmental bodies, it has nevertheless received tremendous support from all the three tiers of government and their sectoral agencies. This support has been achieved primarily through the decentralization of EIA activities among participants and tiers of government, and the effective mechanisms for intergovernmental and interagency co-ordination and co-operation. Environment-related agencies are consulted during the preparation of the terms of reference for detailed assessment, and copies of the EIS are routinely circulated to them by the project initiator for consideration and comments. They also participate in the review exercise, and their approval of relevant sections in the EIS must be obtained by project proponents before or following the completion of the assessment. Because of the federal system of government, and the strong constitutional role of the states in managing natural resources, the Federal Government saw the need to work in close collaboration with the states on environmental matters. Co-operation and coordination are achieved through the Environmental Quality Council and the regional offices of the Department of Environment. More importantly, the power to grant licences is not concentrated in one body, as in The Philippines and Thailand, but shared between the three tiers of government and the Ministry of Trade and Industry.

Table 4: Comparison of seven options of institutional environmental arrangements according to their efficiency to incorporate environmental planning within the development process.

Type of institutional management	Regular authority	Normative role	Influence over resource allocation	Capacity to co-ordinate other sectors	Influence over national planning study	Ability to resolve inter-organ-izational disputes	Ability to influence local environ-ment	Budget
Sectoral agencies which add environmental responsibilities	Limited	Limited	Limited	None	None	None	None	Limited
Central environmental units at ministerial level	High	High	High	High	Limited	High	Limited	Limited
Central ronmental units ubordinate of an existing ministry	Limited	High	Limited	Limited	Limited	Limited	Limited	Limited
Environmental units within sectoral agencies	Limited	Limited	None	None	None/ Limited	None	None	Limited
Assigning roles to existing sectoral units	High	Limited	High	None	None	Limited	High	Limited
Environmental offices within national economic planning units	High	High	High	High	High	None	Limited	High
Regional superagencies and inter-sectoral . commissions	Limited	Limited	None	Limited/ None	None	Limited	High	High

Source: Szekely (1987).

The experience of Mexico, on the other hand, illustrates vividly the weaknesses inherent in the centralization of EIA roles in the environmental agency. Before the establishment, in 1982, of the Ministry of Urban Development and Ecology (Secretaria de Desarolla Urbano y Ecologia—SEDUE) as Mexico's national environmental agency, with responsibilities for rule setting and the co-ordination of the EIA process, the institutional arrangement for EIA was similar to Korea's centralized model with all functions concentrated in each sectoral agency. Although this model has its limitations arising from non-uniformity of EIA guidelines and procedures, each sectoral agency and state enterprise exhibited strong commitment to the EIA system. Since 1982, however, all EIA activities, with the exception of assessment and licensing, are concentrated in the environmental agency. The public and concerned agencies are not involved, and the review committee is not independent of the environmental agency. As in Malaysia, the states and local governments have no environmental agencies. The commitment of the sectoral agencies to EIA has since diminished considerably, and SEDUE has had to enter into negotiations and agreements with them for the submission of project EISs for review by SEDUE (Levy, 1987).

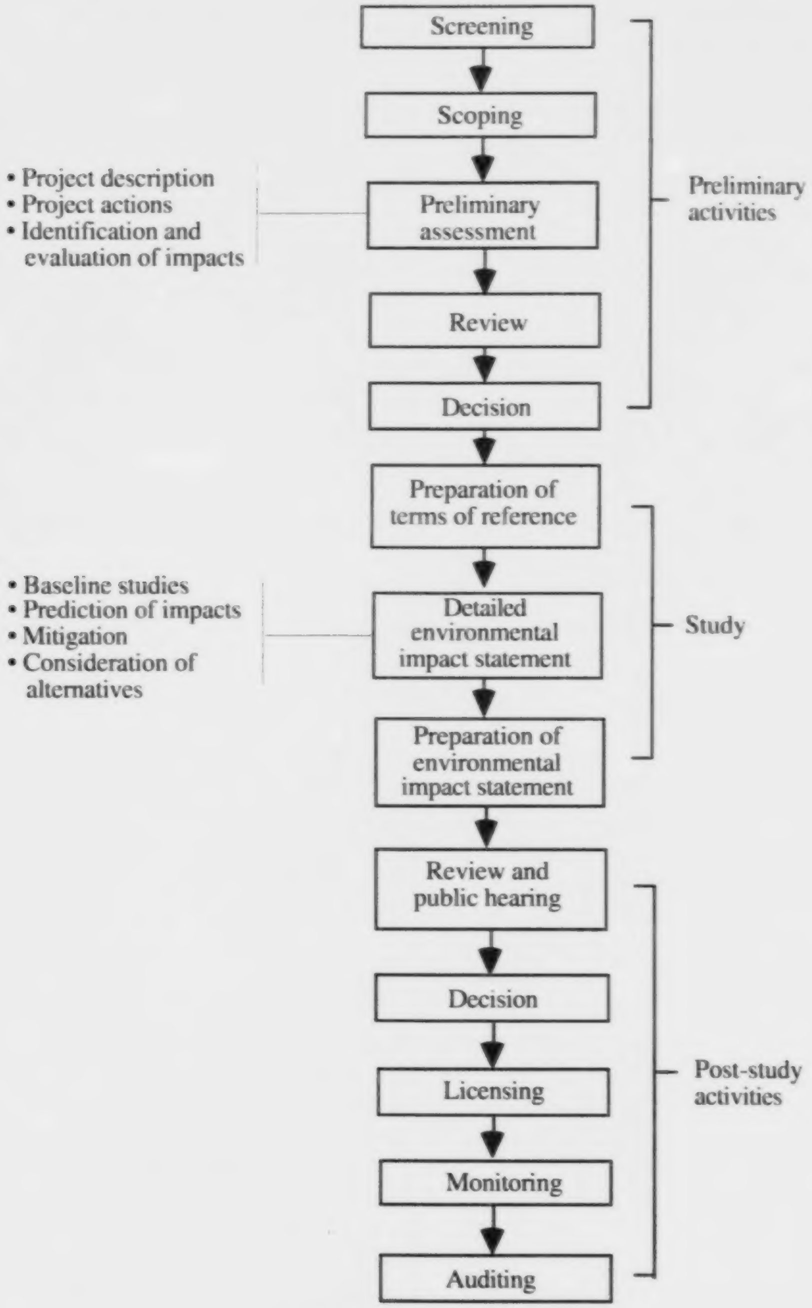

Screening
Scoping
• Project description
• Project actions
• Identification and evaluation of impacts
Preliminary assessment
Review
Decision
Preliminary activities
Preparation of terms of reference
• Baseline studies
• Prediction of impacts
• Mitigation
• Consideration of alternatives
Detailed environmental impact statement
Preparation of environmental impact statement
Study
Review and public hearing
Decision
Licensing
Monitoring
Auditing
Post-study activities

Figure 2. EIA activities.

Table 5. Institutional arrangements for EIA implementation in selected developing countries

EIA activities	Philippines	Thailand	Korea	Malaysia	China	Mexico	Brazil
Rule setting	6	6	3	6	6	6	6
Screening	2	2	3	2	2	6	2
TOR/ scoping	2	2,6	3	2,4,6	1,2,4,5	6	8
Assessment	2	1	3	1/2	1/2	1/2	1
Review	7	6	6	7	7	6	6/7
Licensing	10	3,9	3	8	3	3	8
Monitoring	6	6	3	6	2,3,6	6	6
Type of model	Functionally decentralized	Functionally decentralized	Centralized in lead agency	Functionally decentralized	Hierarchically decentralized	Centralized in environment-al agency	Hierarchically decentralized

Key: 1 = consultant; 2 = project proponent (public and private); 3 = lead/responsible/authorizing agency; 4 = concerned agencies; 5 = the public; 6 = environmental agency; 7 = independent review committee; 8 = federal, state, local authorities; 9 = cabinet; 10 = president.

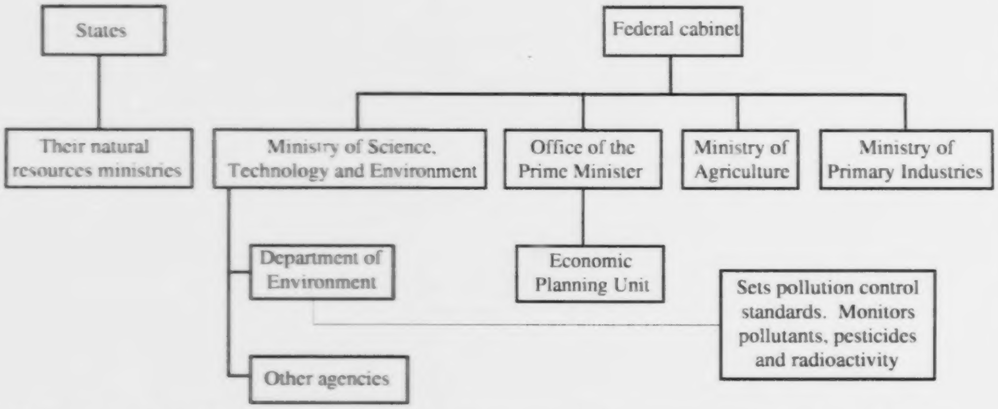

States
Federal cabinet
Their natural resources ministries
Ministry of Science, Technology and Environment
Office of the Prime Minister
Ministry of Agriculture
Ministry of Primary Industries
Department of Environment
Economic Planning Unit
Sets pollution control standards. Monitors pollutants, pesticides and radioactivity
Other agencies

Figure 3: Simplified organizational chart for natural systems management in Malaysia. Source: DOE Malaysia, 1987.

5. PROCEDURAL FRAMEWORKS

EIA procedures refer to the sequencing of tasks among participants in the EIA process. Procedural issues focus on who sets the rules, who does the screening and scoping, who carries out the assessment, who reviews and what is the review process, and the who, when and how of public participation. EIA procedures, therefore, define the formal structure for carrying out the assessment of the environmental implications of projects and its integration in the project cycle. Although EIA can be undertaken without a set of formal procedures, as is the case in Korea and Western Australia, the existence of procedures ensures uniformity and guarantees that all relevant projects are examined for their environmental consequences in a clearly-defined structured manner so that the assessment is thoroughly executed and the results are effectively utilized. It also eliminates inconsistencies in the assessment of similar proposals, as well as the personal prejudices, whims and caprices of environmental agency or lead agency officials. The absence of a defined assessment procedure also creates uncertainties in the minds of project proponents as to what actions they are expected to take, or what in fact is required of them. Such a situation provides a fertile ground for corruption, nepotism and trade-offs.

Only six of the 19 developing countries with EIA systems have laid-down procedures for environmental assessment; these are The Philippines, Thailand, Malaysia, China, Mexico and Brazil. The procedural frameworks employed by these countries to implement the EIA requirement, however, vary considerably from country to country. In fact, each country has its own individual approach to EIA. Foreign EIA procedural models have been tried in some of the countries and found to be unworkable because the countries lack the socio-cultural, political and administrative infrastructure to implement and enforce them. Consequently, EIA procedures have been modified to suit local conditions, especially the socio cultural and political environments, indigenous resources and the long-established planning process and development control mechanisms .

Thailand has the most elaborate EIA procedure among the developing countries with EIA systems, and is unique in having two distinct procedural flows, one for private and the other for public projects (Figures 4 and 5), in contrast to the single framework in all other developed and developing countries (see Figures 6 and 7, for example). The procedural flow for private sector development in Thailand has the following steps or phases (Figure 4).

Phase I. Project proponent prepares the terms of reference (TOR) for the EIS study and submits it to NEB for review and modification.

Phase II. Project proponent then hires an assessor who must be a consultant registered with NEB.

Phase III. Project proponent submits EIS to NEB through the appropriate permitting agency.

Phase IV. The Environmental Impact Evaluation Division (DEIE) of NEB reviews the EIS, and the exercise must be completed within 90 days, failing which it is deemed that the EIS has been approved by NEB.

Phase V. If EIS is not approved, NEB will request more detailed information, clarification or mitigating measures from the project proponent through the permitting agency. If EIS is approved the conditions, if any, are included in the permitting licence.

Phase VI. After necessary corrections by the project proponent, the permitting agency sends the revised EIS to NEB for a second review which must be completed within 30 days, failing which the EIS is deemed approved.

Phase VII. When EIS is approved, licensing is done by the permitting agency.

Project implementation is subsequently monitored by NEB for compliance.

The procedural flow for government projects and state enterprises is significantly different in many respects (Figure 5).

Phase 1. Government agency sends TOR to NEB for approval.

Phase 11. Government agency carries out the assessment by itself or hires a consulting firm not necessarily registered with NEB.

Phase III. The agency sends EIS to both NEB and the National Economic and Social Development Board (NESDB), which is in the Prime Minister's Office.

Phase IV. NEB reviews EIS within the same time frame for private projects.

Phase V. When EIS is approved, NEB informs NESDB of approval.

Phase VI. NESDB carries out economic and engineering feasibility studies, incorporating the environmental issues, and submits the project proposal to the cabinet to make the final decision.

Phase VII. Cabinet approves or rejects the project.

If the project proposal is approved, NEB monitors its implementation for compliance.

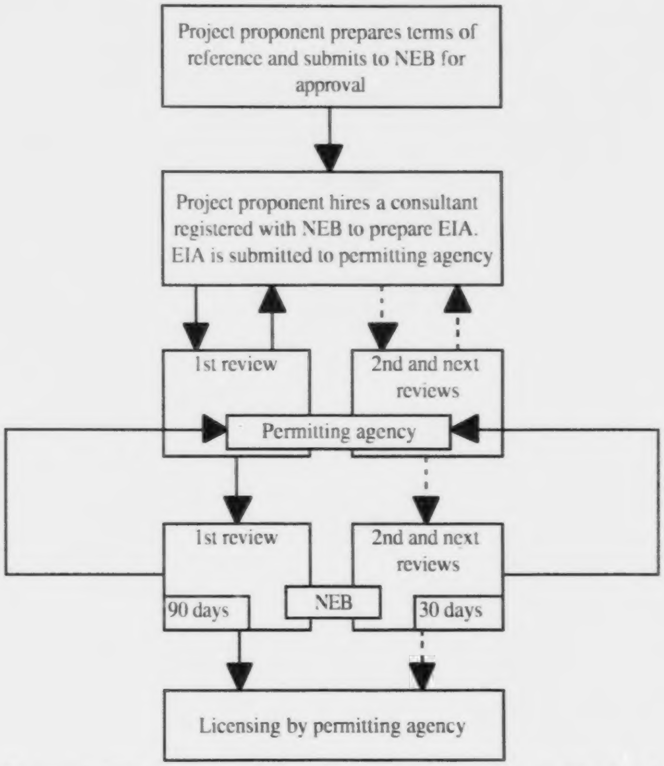

Project proponent prepares terms of reference and submits to NEB for approval
Project proponent hires a consultant registered with NEB to prepare EIA. EIA is submitted to permitting agency
1st review
2nd and next reviews
Permitting agency
1st review
2nd and next reviews
90 days
NEB
30 days
Licensing by permitting agency

Figure 4. EIA procedural flow for private projects in Thailand.

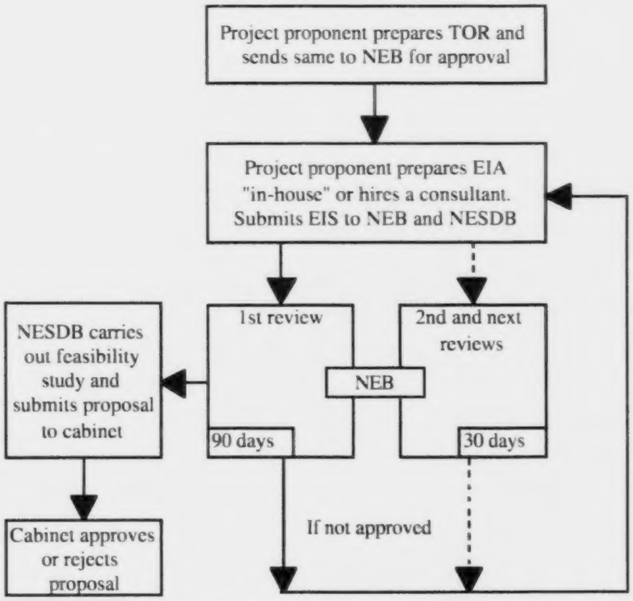
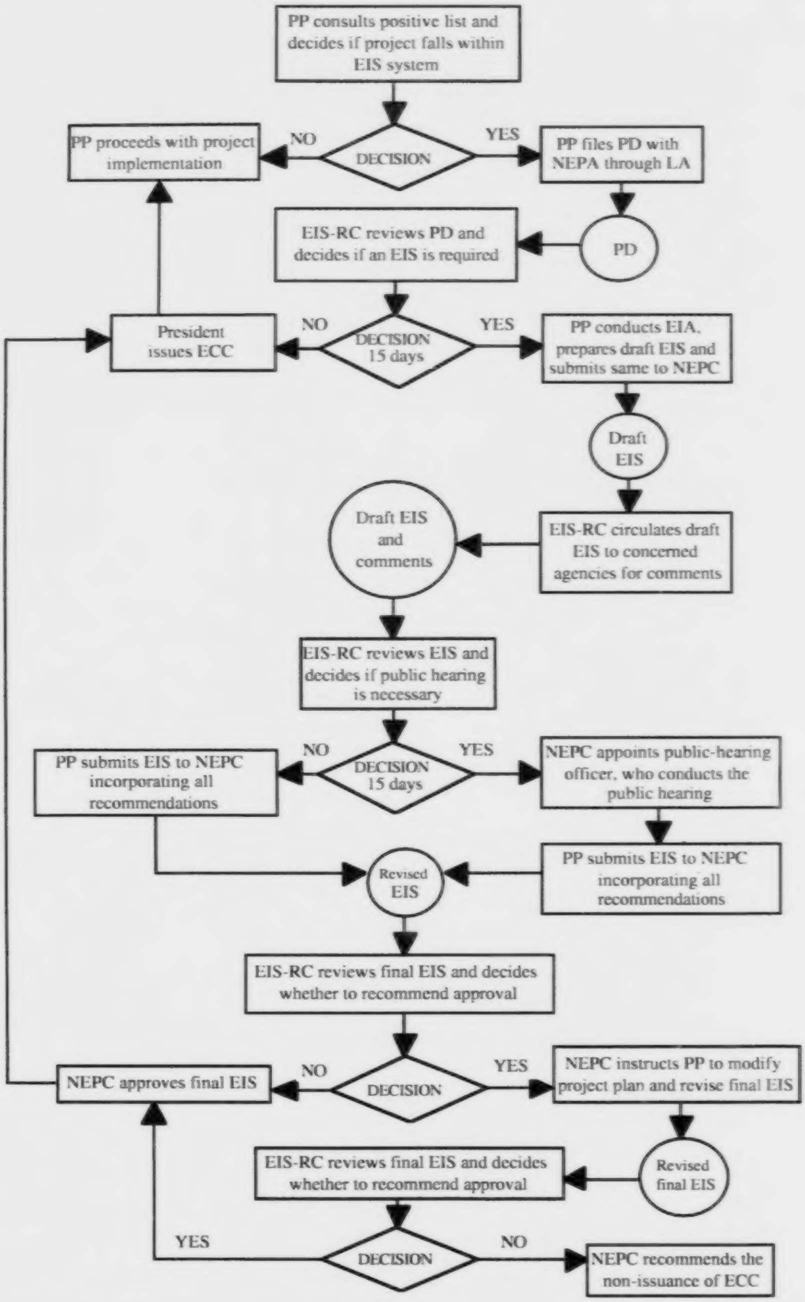
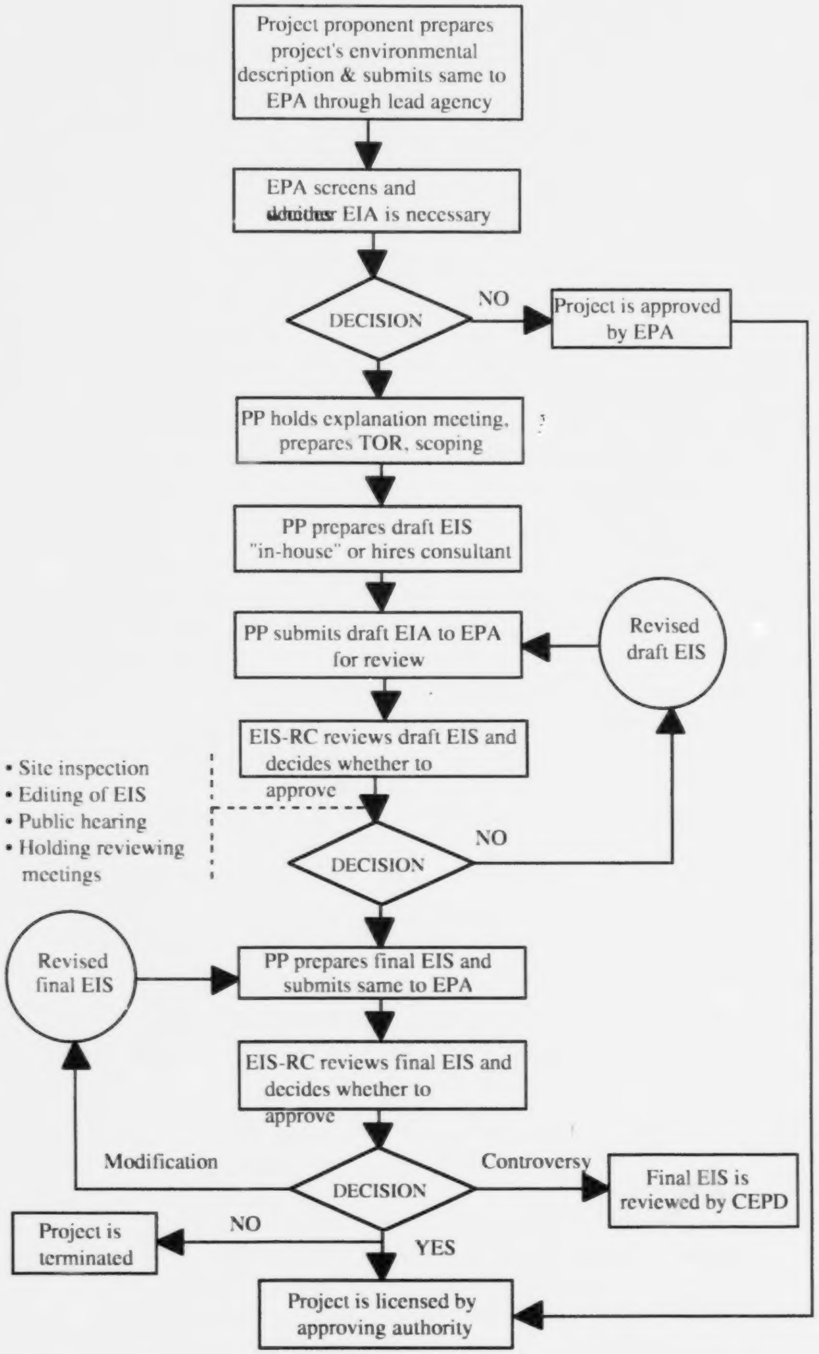

Project proponent prepares TOR and sends same to NEB for approval
Project proponent prepares EIA "in-house" or hires a consultant. Submits EIS to NEB and NESDB
NESDB carries out feasibility study and submits proposal to cabinet
1st review
2nd and next reviews
NEB
90 days
30 days
Cabinet approves or rejects proposal
If not approved

Figure 5 EIA procedural flow for government and state enterprises' development projects in Thailand


PP consults positive list and decides if project falls within EIS system
PP proceeds with project implementation
NO
DECISION
YES
PP files PD with NEPA through LA
EIS-RC reviews PD and decides if an EIS is required
PD
President issues ECC
NO
DECISION 15 days
YES
PP conducts EIA, prepares draft EIS and submits same to NEPC
Draft EIS
Draft EIS and comments
EIS-RC circulates draft EIS to concerned agencies for comments
EIS-RC reviews EIS and decides if public hearing is necessary
PP submits EIS to NEPC incorporating all recommendations
NO
DECISION 15 days
YES
NEPC appoints public-hearing officer, who conducts the public hearing
Revised EIS
PP submits EIS to NEPC incorporating all recommendations
EIS-RC reviews final EIS and decides whether to recommend approval
NEPC approves final EIS
NO
DECISION
YES
NEPC instructs PP to modify project plan and revise final EIS
EIS-RC reviews final EIS and decides whether to recommend approval
Revised final EIS
YES
DECISION
NO
NEPC recommends the non-issuance of ECC

Legend
PP = project proponent
PD = project description
EIS = environment impact statement
ECC = environmental compliance certificate
LA = lead agency
EIS-RC = EIS Review Committee
NEPC = National Environmental Protection Council

Figure 6. EIA procedural flow in the Philippines.


Project proponent prepares project's environmental description & submits same to EPA through lead agency
EPA screens and determines whether EIA is necessary
DECISION
NO
Project is approved by EPA
PP holds explanation meeting, prepares TOR, scoping
PP prepares draft EIS "in-house" or hires consultant
PP submits draft EIA to EPA for review
Revised draft EIS
EIS-RC reviews draft EIS and decides whether to approve
• Site inspection
• Editing of EIS
• Public hearing
• Holding reviewing meetings
DECISION
NO
Revised final EIS
PP prepares final EIS and submits same to EPA
EIS-RC reviews final EIS and decides whether to approve
Modification
DECISION
Controversy
Final EIS is reviewed by CEPD
NO
Project is terminated
YES
Project is licensed by approving authority

Legend PP = project proponent
EIS = environment impact statement
EIS-RC = EIS Review Committee
EPA = Environment Protection Authority
CEPD = Council for Economic Planning and Development

Figure 7. EIA procedural flow in China.

An EIA procedure should be well-structured to ensure the realization of the twin objectives of EIA outlined by Caldwell (1978) in respect of NEPA as the incorporation of environmental values at the earliest stage of planning and decision-making (including policy and programme formulation) and the disclosure of environmental consequences of planned actions and increased public scrutiny and involvement. The following are suggested as basic elements, therefore, of an EIA procedure.

1. The assessment should be conducted in two stages, as in The Philippines, Thailand, Malaysia, China and Mexico, in order to save considerable time and cost involved in detailed assessments. All projects, irrespective of type, scale. threshold or environmental sensitivity, should be subjected to a preliminary or initial environmental assessment or screening using simple methods such as the Leopold matrix (Leopold et al., 1971) or a checklist to determine whether or not they are likely to have serious environmental impacts. Only projects with potentially serious environmental consequences are then subjected to detailed environmental assessment leading to the preparation of an environmental impact statement.
2. Scoping should be mandatory, and the public, affected communities and concerned agencies must be involved in the exercise. Scoping is an activity designed to identify the key, priority and contentious issues relating to a proposed development or course of action and, therefore, should form the basis of the assessment. It helps, therefore, in focusing the assessment, thereby saving time and cost. More importantly, it provides a much needed opportunity for the consideration of local resources, societal values, preferences and perceptions, political styles and socio-cultural conflicts in resource development. Because decisions about development proposals are based on the contents of EISs, the document should provide decision-makers with a balanced coverage of economic, social, cultural, as well as biophysical, costs and benefits. EIAs which evade socio-cultural issues are bound to make inaccurate predictions. Project proponents, therefore, should hold explanatory meetings (as in China, Figure 7) with the local people, representatives of interest groups and relevant government agencies in order to identify the major issues on which the environmental assessment should focus.
3. Terms of reference (TOR) should be prepared by the project proponent in consultation with the EIS review committee. The TOR is a useful document to project proponents and the review committee in that it specifies the EIS requirements for a given project, thus guaranteeing that the EIS will be suitable for review and evaluation.
4. The environmental assessment should be conducted 'in-house" by the project proponent or by the use of consultants duly registered with the environmental agency. The rationale for this requirement is that the project proponent is most knowledgeable about his project activities, and, therefore, is better placed than the environmental agency to utilize environmental information effectively to improve project design through the preparation of the EIS as part of project planning. The mandatory use of registered consultants as in Thailand and Brazil ensures high quality environmental research and reporting. Any bias, distortions in data collection, analysis and presentation can be easily detected at the review and public-hearing stages. The threat of litigation and the ethics of the consultant's profession are adequate deterrents to such bias and distortions.
5. The EIS should be circulated to all concerned government agencies. This circulation ensures that all relevant environmental issues are satisfactorily addressed in the EIS, thus ensuring the high quality of EISs. In Malaysia, for example, project proponents

must obtain the approval of environment-related concerned agencies of relevant sections of the EIS before or following the completion of the assessment. The circulation of EISs to concerned agencies is also an effective way of achieving interagency co-operation essential for the success of the EIA system. The EIS should be made available also to the public to ensure that the socio-cultural issues canvassed during the explanatory meeting and scoping have been adequately addressed in the EIS.

6. There should be provision for a public hearing. This hearing provides a forum for a thorough analysis of the conclusions and proposals in the EIS, and a more direct public input into the final EIS on which decisions are to be based. By providing the affected people with a mechanism for presenting their entire range of social, economic and political problems and aspirations to government, public hearings help to guarantee public support and endorsement, thus creating an enabling environment for environmentally-sound decisions to be successfully implemented.

   The need for the establishment of an appropriate machinery for adequate and effective participation of the public in the EIA process also cannot be overemphasized, in view of the very important distinction between environmental effects and impacts. While effects, that is changes resulting from a proposed action, can be objectively predicted, environmental impacts or the desirability of such changes can be valued differently by various interest groups. It is important, therefore, that those who will actually experience the effects, both directly and indirectly, have a say in evaluating them. The machinery to be established for this purpose depends on the socio-political environment and level of environmental awareness in a country. The Guidelines for EIA in Malaysia specify the following methods for obtaining public participation in the EIA process: viz. public opinion sampling, public meetings or workshops and regular meeting with a citizens' committee truly representative of the community likely to be directly affected by the project. The danger in an open-ended public involvement is that the EIA process may degenerate into a political contest between interested groups with opposing political views.

7. Time limits should be set for EIS reviews. This limitation ensures that project implementation is not unduly delayed as a result of the EIA requirement.

8. In order to ensure that the development proposal is executed in line with measures approved in the EIS, concerned agencies should be involved in monitoring compliance and post-project audits. The monitoring and auditing committee should consist of representatives of the environmental agency, concerned agencies, project owner and local people affected by the project.

If these yardsticks are employed in evaluating the adequacy of EIA procedures in developing countries, the inevitable conclusion to be drawn is that the procedures suffer from major weaknesses which make the realization of the intent and purpose of EIA difficult to achieve. Table 6 shows that the EIA procedural frameworks in Malaysia and China satisfy most of these conditions. At the other extreme are Korea and Mexico. The most serious weakness of the EIA procedures in all the countries except China is the non-involvement of the public and concerned agencies in scoping. In most of the countries, there is also no provision for public hearing. It can be argued, therefore, that EIA, as practised in the developing countries, cannot achieve one of its major aims, i.e. the disclosure of the environmental consequences of planned actions and increased public scrutiny and involvement. These shortcomings must be adequately redressed.

6. INTEGRATION OF EIA IN THE PROJECT CYCLE

The EIA system has been described as a procedure for the identification and disclosure of the environmental consequence of proposed developmental actions, and the incorporation of environmental considerations at the earliest stage in the project cycle to influence planning, design, implementation and management. Effective incorporation can only be achieved if, and only if, EIA is a fully internalized element of the planning process (Figure 8). This means that the environmental assessment should be carried out at the inception of a proposed action when there is still a real choice between alternative courses of action, such as alternative sites, designs, feasible strategies of action, technologies for aspects of the project, as well as the alternative to do nothing. EIA guidelines should also clearly specify the stage in the project cycle at which each EIA activity (preliminary assessment, detailed assessment, monitoring, etc.) is to be carried out, and how the results are to be used in project planning, design, implementation and operation .

In most of the developing countries with EIA systems, EIA is conducted more or less as a separate technical exercise divorced from the technical and economic aspects of project planning and design. More often than not, the environmental assessments are conducted at the latest project plan stage when most of the plan details have been finalized and there is little or no opportunity to consider alternatives. EIA then becomes a postscript to planning and is used basically as a perfunctory endorsement of public or private actions rather than to influence decisions. Even when conducted at the very early stage in the project cycle, neither the project proponent nor the reviewers and lead agencies take the environmental consequences seriously. As Evans (1983) has rightly observed in respect of South-East Asia, "It seems that a general misconception prevails that, once the EIA study is completed, the environmental effects of the project are managed". In fact, the EISs produced in Thailand and The Philippines, two countries with the most elaborate EIA systems in the Third World, have been aptly described as "nothing but a collection of unsynthesized biophysical data irrelevant to the choice among real alternatives" (Roque, 1985). It is not surprising, therefore, that the hundreds of EISs submitted to environmental agencies in South-East Asia have had very limited impact in minimizing the environmental consequences of the projects.

Table 6. Evaluation of EIA procedural frameworks in some developing countries

	Philippines	Thailand	Korea	Malaysia	China	Mexico	Brazil
Use of preliminary or initial environmental assessment for screening	Yes	Yes	No	Yes	Yes	Yes	No
Involvement of the public and concerned agencies in scoping	No	No	No	No	Yes	No	Yes
Preparation of terms of reference	No	Yes	No	Yes	Yes	No	Yes
Conduct of the assessment and preparation of EIS by project proponent with the assistance of consultants	No	Yes	No	Yes	Yes	No	Yes
Circulation of EIS to concerned agencies and made available for public scrutiny	Yes	No	No	Yes	Yes	No	Yes
Provision for mandatory public hearing	No	No	No	Yes	Yes	No	No
Time limits set for EIS review	Yes	Yes	No	Yes	No	Yes	No
Lead and concerned agencies involved in monitoring and auditing	No	No	No	No	Yes	No	No

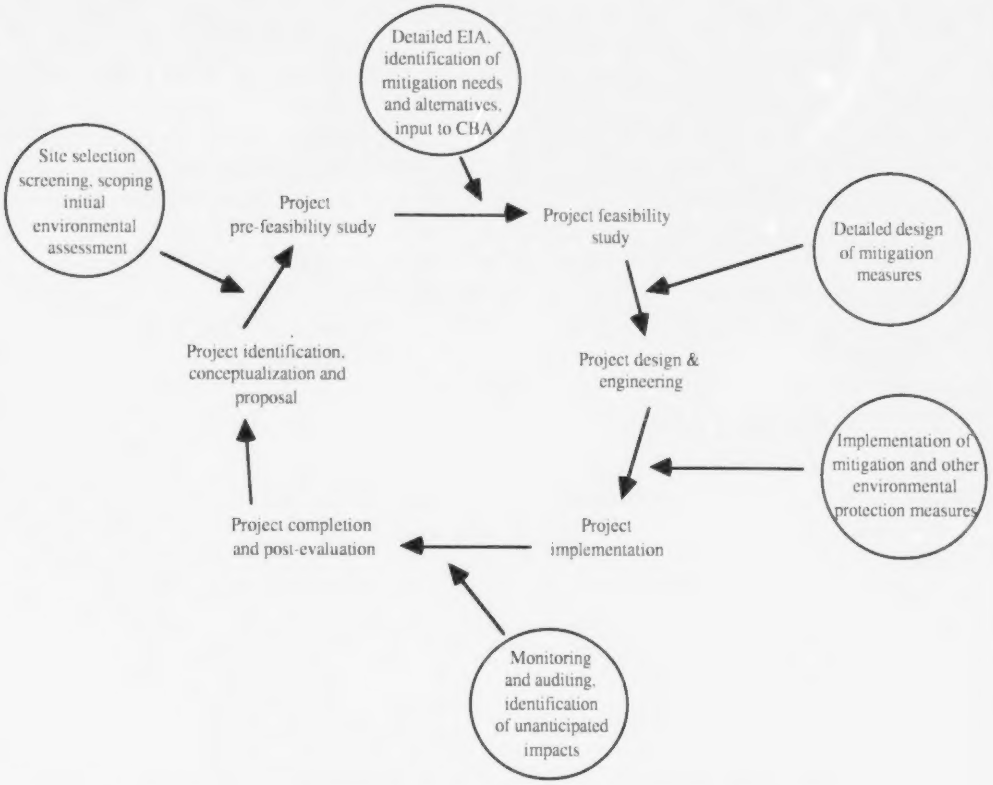

Detailed EIA, identification of mitigation needs and alternatives, input to CBA
Site selection screening, scoping initial environmental assessment
Project pre-feasibility study
Project feasibility study
Detailed design of mitigation measures
Project identification, conceptualization and proposal
Project design & engineering
Implementation of mitigation and other environmental protection measures
Project completion and post-evaluation
Project implementation
Monitoring and auditing, identification of unanticipated impacts

Figure 8. Integrating EIA into the project cycle. (Modified from ADB, 1988).

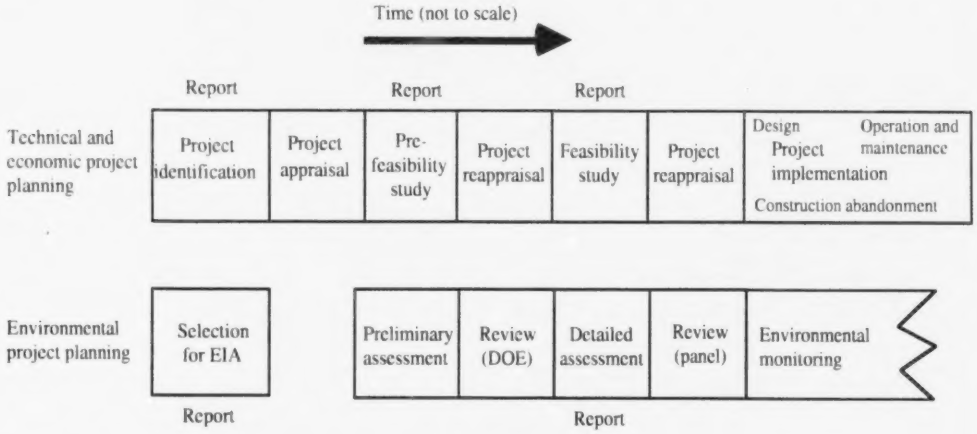

Time (not to scale)
Report
Report
Report
Technical and economic project planning
Project identification
Project appraisal
Pre-feasibility study
Project reappraisal
Feasibility study
Project reappraisal
Design
Operation and maintenance
Project implementation
Construction abandonment
Environmental project planning
Selection for EIA
Preliminary assessment
Review (DOE)
Detailed assessment
Review (panel)
Environmental monitoring
Report
Report

Figure 9. Malaysia's integrated project-planning concept.
Source: DOE Malaysia, 1987).

It is only in Brazil, Malaysia and Mexico that there are adequate arrangements for the integration of EIA in the project cycle. In Malaysia, for example, apart from the chart to guide project proponents in the integration of the technical, economic and environmental elements of planning (Figure 9), the EIA guidelines make it mandatory for project proponents to take the recommendations of the review panel into consideration and incorporate them into the final design of the proposed project. The final project design incorporating these recommendations must also be submitted to the Department of Environment prior to the construction of the project. Also importantly, the project proponent "in the course of carrying out such activity, shall provide sufficient proof that the conditions attached to the report (if any) are being complied with, and that the proposed measures to be taken to prevent, reduce or control the adverse impact on the environment are being incorporated into the design, construction and operation of the prescribed activity" (DOE, 1987). In Mexico, also, the EIS must be approved before a project's final design is produced. Brazil effectively internalizes EIA in the project cycle by incorporating it into her long-existing three-stage licensing system (Figure 10, Table 7), and there is a built-in mechanism for continuous monitoring of every stage of project implementation for compliance with recommendations contained in previous licences.

It is suggested that the EIA system should be integrated with the existing planning or development control framework in each country (Ayanda, 1988). The mechanism for this integration should be clearly specified in the EIA guidelines. There should also be provision for continuous monitoring of compliance with recommendations, and the environmental agency should be empowered to intervene at any stage during project implementation if any of the directives in the licence are not being complied with.

7. SUMMARY AND CONCLUSION

Although progress in the adoption of EIA as an environmental management tool has been extremely slow in the developing countries because of largely technical issues, there is now a heightened awareness among these countries of the potential benefits of the EIA system. In the few countries that have so far established administrative machineries and legal instruments for the implementation of EIA, however, the performance outcome of the system has been extremely poor. This poor performance is attributable to defects in their legislative, administrative, institutional and procedural frameworks, which are inadequate to varying degrees for a process such as EIA with a multi-sectoral character, and which demands for its success, therefore, considerable interagency co-ordination and co-operation, the ability of the environmental agency to enforce and monitor compliance with environmental laws and regulations and to influence investment decisions in both the public and private sectors of the economy, as well as unfettered disclosure of environmental consequences, public scrutiny and involvement. The proceeding analyses reveal that these basic ingredients of the EIA system are either lacking or inadequately addressed in most of the developing countries with EIA systems.

It is argued, therefore, that while the search for simple, cost-effective EIA methodologies and techniques should continue unabated, especially in view of the increasing complexity and rigour of EIA methods and techniques being actively promoted in the developed countries, research efforts in Third World countries should focus more on the creation of an enabling environment for EIA's introduction, and the development of appropriate legislative, administrative, institutional and procedural frameworks for effective EIA implementation, given the political and socio-cultural situation in each country. In this regard, developing countries can benefit not only from the experience of the developed nations, but also, more importantly, from the experience of the developing countries with about a decade of EIA implementation and with which they share common political and socio-economic characteristics.

Table 7. Brazil's national licensing system

Level	Stage	Information required
Provisional	Planning	Proposed project site, installation, operation, federal, state, municipal plans in the project area Environmental impact statement
Installation	Construction	Specifications of the final approved project design Environmental impact statement
Operation	Following inspection of early operation/ pollution control equipment	Is operation as stated in the provisional and installation licences?

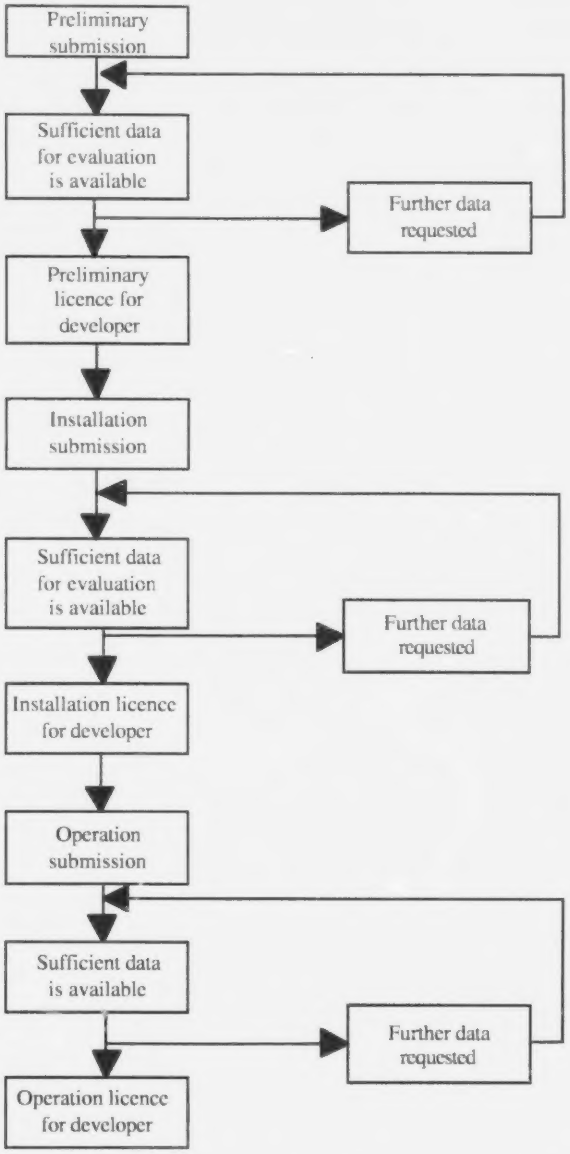

Preliminary submission
Sufficient data for evaluation is available
Further data requested
Preliminary licence for developer
Installation submission
Sufficient data for evaluation is available
Further data requested
Installation licence for developer
Operation submission
Sufficient data is available
Further data requested
Operation licence for developer

Figure 10. The permit system and EIA in Rio de Janeiro, Brazil
Source: Costa and Silveria, 1980)

REFERENCES

Abel, N and Stocking, M. (1981). The experience of underdeveloped countries, In Project Appraisal and Policy Review (T. O'Riordan and W.R.D. Sewell, eds), pp 253-295, Chichester: J. Wiley & Sons.

Adams, W.M. (1982). Third World EIA: a whole new ball game. ECOS 3, 30-35

Ahmad, Y. and Sammy, G.K. (1985). Guidelines to Environmental Impact Assessment in Developing Countries. London: Hodder and Stoughton.

Asian Development Bank, (1988). Environmental Planning and Management and the Project Cycle. ADB Environment Paper No. 1. Manila: ADB.

Asian Institute of Technology, (1982). WHO/NEB/AIT Intercountry Workshop on Rapid Techniques for Environmental Assessment in Developing Countries. Bangkok: AIT.

Ayanda, J. O. (1988). Incorporating environmental impact assessment in the Nigerian planning process. Third World Planning Review 10, 51-64.

Biswas, A.K. and Geping, Q. (eds) (1987). Environmental Impact Assessment for Developing Countries. London: Typcooly International.

Caldwell, L. K. (1978). The environmental impact statement: a misused tool. In Environmental Impact Assessment—Emerging Issues in Planning (R. K. Jain and B. L. Hutchings, eds), pp. 11-25. Urbana: University of Illinois Press.

Costa, P.A.S. and Silveira, R.S.A. (1980). Environmental impact assessment in Brazil. Industry and Environment Special Issue No. 1, 2.

Department of the Environment, Malaysia. (1987). A Handbook of Environmental Impact Assessment Guidelines. Kuala Lumpur, Malaysia.

Ebisemiju, F. S. (In press). Institutionalizing sustainable development in Nigeria: retrospect and prospects. Journal of Issues in Social Science.

Ebisemiju, F. S. (1991). Creating an enabling environment for environmental impact assessment in Africa. Journal of Issues in Social Science t(3), 78-89.

Environmental Resources Limited. (1987). Final Report of the Senior Level Expert Workshop to Evaluate Benefits and Constraints of Environmental Impact Assessment Process in SACEP Countries. London: ERL.

Evans, J. W. (1982). An overview of environmental impact assessment activities and programs in selected Asian countries. In WHO/WEB/AIT Intercountry Workshop on Rapid Techniques for Environmental Assessment in Developing Countries. Bangkok: Asian Institute of Technology.

Evans, J. W. (1983). The Use of Environmental Impact Assessment for Developing Project Planning in ASEAN Countries. Bangkok: United Nations Environment Program.

Federal Environmental Protection Agency, Nigeria. (1989). National Policy on the Environment. Lagos: FEPA.

Federal Republic of Nigeria. (1981). The Fourth National Development Plan (1975-1980). Lagos.

Gamman, J. K. and McCreary, S. T. (1988). Suggestions for integrating EIA and economic development in the Caribbean region. Environmental Impact Assessment Review 8, 43-60.

Geoghegan, T. (ed.) (1985). The Caribbean Seminars on Environmental Impact Assessment: Case Studies. Barbados: Centre for Resource Management and Environmental Studies, University of the West Indies.

Giliomee, J. (1980). The implementation of environmental impact assessment in South Africa. Journal of Regional Planning 12, 9-12.

Horberry, J. (1984). Status and Application of Environmental Impact Assessment for Development. Gland: IUCN.

Htun, N. (1988). The EIA process in Asia and the Pacific region. In Environmental Impact Assessment: Theory and Practice (P. Wathern, ed.), pp. 224-238. London: Unwin Hyman.

Ibarra, A. B. (1987). Reflections on the incorporation of an environmental dimension into the institutional framework and operations of the public sector in Latin America and the Caribbean. In Conference on the Environment pp. 55-76. Washington, D.C.: Inter-American Development Bank.

Leonard, H.J. (ed.) (1985). Divesting Nature's Capital: the Political Economy of Environmental Abuse in the Third World. London: Holmes and Meier.

Leonard, H. J. and Morell, D. (1981). Emergence of environmental concern in developing countries- a political perspective. Stanford Journal of International Law 7, pp 281-313.

Leopold, L. B., Clarke, F. E., Henshaw, B. B. and Balsley, J. B. (1971). A Procedure for Evaluating Environmental Impact. U.S. Geological Survey Circular 645.

Levy, J. P. (1987). Environmental impact assessment in Mexico. In Proceedings of the International Workshop on Impact Assessment International Development pp. 644-654. Barbados: IAIA.

Lim, G. (1985). Theory and practice of EIA implementation: a comparative study of three developing countries. Environmental Impact Assessment Review 5, 133-153.

Lin Lewis, S. J. (1989). EIA in Taiwan: current status and future trends. Environmental Impact Assessment Review 9, 67-73.

Lohani, N. N. (1985). Legislative and institutional status of EIA in Asia and Pacific region. The Environment Professional 7, 1986-1990.

Lowry, K. and Carpenter, R. A. (1985). Institutionalizing sustainable development: experiences in five countries. Environmental Impact Assessment Review 239-254.

Moreira, I. V. (1988). EIA in Latin America. In Environmental Impact Assessment. Theory and Practice (P. Wathern, ed.), pp. 239-253. London: Unwin Hyman.

Munn, R. E. (ed.) (1979). Environmental Impact Assessment. Principles and Procedures. Chichester: J. Wiley & Sons.

Ning, D. W. H. and Whitney, J. (1988). Environmental impact assessment in China: present practice and future developments. Environmental Impact Assessment Review 8, 85-95.

Renard, Y. (1987). Development planning and impact assessment in the eastern Caribbean: some institutional requirements. In Proceedings of the International Workshop on Impact Assessment for International Development, pp. 511 - 515. Barbados: IAIA.

Roque, R. (1985). Environmental impact assessment in the association of southeast Asian nations. Environmental Impact Assessment Review 5, 257-264.

Sammy, G. K. and Canter, L. W. (1981). Environmental impact assessment in developing countries: What are the problems? Impact Assessment Bulletin 2, 29-43.

Suriyakumaran, C. (ed.) (1980). Environmental Impact Statements. a Test Model Presentation. Bangkok: UNEP Regional Office for Asia and the Pacific.

Szekely, F. (1987). Strategies to strengthen environmental quality in the IDB development project cycle. In Conference on the Environment pp. 77-102. Washington, D.C.: Inter-American Development Bank.

Tolentino, A. S. (1986). Review of environmental legislation and administration and its application in selected DMCs. In Environmental Planning and Management pp. 47-95. Manila: Asian Development Bank.

Towle, E. L. (1987). Challenges facing development planning and impact assessment: a Caribbean perspective. In Proceedings of the International Workshop on Impact Assessment for International Development pp. 72-83. Barbados: IAIA.

UNEP. (1988). Environmental Impact Assessment : Basic Procedures for Developing Countries. UNEP Regional Office for Asia and the Pacific.

Wandesford-Smith, G., Carpenter, R. A. and Horberry. J. (1985). EIA in developing countries: an introduction. Environmental Impact Assessment Review 5 201-206

Zi, Z. (1987). Current practice of environmental impact assessment in China: the example of a developing country. In Proceedings of the International Workshop on Impact Assessment for International Development, pp. 592-604. Barbados: IAIA.

EIA Operating Principles

EIA should be applied:

- to all development project activities likely to cause potentially significant adverse impacts or add to actual or potentially foreseeable cumulative effects
- as a primary instrument for environmental management to ensure that impacts of development are minimised, avoided or rehabilitated
- so that the scope of review is consistent with the nature of the project or activity and commensurate with the likely issues and impacts
- on the basis of well defined roles, rules and responsibilities for key actors

Sadler, 1996

EIA can:

- modify and improve design
- ensure efficient resource use
- enhance social aspects
- identify measures for monitoring and managing impacts
- inform decision-making

EIA trends as identified by the Effectiveness Study:

- EIA systems now include a greater range of factors: social, risk, health etc
- temporal and spatial boundaries are being extended to include cumulative and regional scale effects
- policy, plan and program level decisions are starting to be addressed through SEA
- sustainability perspectives and principles are beginning to be incorporated.

Achieving strong EIA requires:

- strong legislation and legal system
- a clear perception of the aims of the process and its potential benefits
- political commitment
- a sound policy basis
- institutional capacity
- adequate technical capacity, data and information
- public involvement
- financial capacity
- professional expertise

Developing EIA procedures requires:

- the support of government
- understanding of political, social, economic and planning processes
- knowledge of the range of ways in which EIA can be implemented
- understanding of the future directions for EIA

Steps to developing an EIA system:

- establish goals
- review other EIA systems
- identify obligations under Treaties
- learn from the experience of others
- incorporate features to move towards sustainability
- identify procedures and standards
- develop trial guidelines
- produce legislation
- incorporate processes for monitoring and review

EIA Systems—Local Rules of Thumb

Topic 3—Public Involvement

Objective

To develop an understanding of:

- the ways in which public involvement can assist the development and implementation of proposals;
- the requirements of the various stakeholders;
- the ways in which public involvement can be structured; and
- the different stages of the EIA process at which public involvement is possible.

Relevance

Public involvement is a feature of nearly all EIA systems and can lead to better and more acceptable decision-making. It can be time consuming and demanding, yet without it, proposals are seldom soundly based, and there is likely to be antagonism from people affected by them.

Public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the proposal, will lead to better outcomes, and lay the basis for ongoing positive relationships between the participants.

Timing

Two hours (not including training activity)

☑ Information checklist

Obtain or develop the following, as appropriate:

- ☐ examples of locally relevant public involvement techniques, and examples of how they have been used;
- ☐ examples of public involvement programmes which have been undertaken locally, and which demonstrate good and bad practice;
- ☐ estimates of the resources necessary to support a public involvement programme, in terms of time, people and money;
- ☐ examples of submissions from the public to the review of EIA reports;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres able to provide assistance in relation to public involvement;
- ☐ copies of any research focused on public involvement; and
- ☐ other resources that may be available such as videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Introduce the role of public involvement in the EIA process. Ask the participants to identify which parties might have a stakeholder interest in being involved in an EIA and why they might wish to be involved.

The public involvement of stakeholders in EIA is widely recognized as a fundamental element of the process. Timely, well planned and well implemented public involvement programmes have contributed to the successful design, implementation, operation and management of proposals.

1

The range of stakeholders involved in an EIA typically includes:

- the people, individuals or groups in the local community
- the proponent and other project beneficiaries
- government agencies
- NGOs
- others, such as donors, the private sector, academics etc.

Local people

Individuals or groups in the local community will want to know what is proposed; what the likely impacts are; that their values are known, understood and taken into account; and that the suggestions they may offer will be carefully considered on their merits. They will want proponents to listen to their concerns and address them. They will also have local knowledge that can be tapped.[1]

Proponents

Many proponents will share some of the above objectives, and will have others as well. Proponents will wish to shape the proposal to give it the best chance of success. This often involves achieving increased public understanding and acceptance of the proposal through the open provision of information. The design can also often be improved through the use of local knowledge and an understanding of local values.

Government agencies

For administrators and decision-makers, an effective public involvement programme can mean that the project is less likely to become controversial in the later stages of the process.

NGOs

Comments from NGOs often provide a useful broader public perspective on a proposal. Their views can also be very helpful when there are difficulties with involving the local people (although these can never fully replace those solicited directly from the people themselves).

Others

Other interested groups such as those working in tertiary institutions and experts in particular fields can also make a significant contribution. The advice and knowledge of government agencies and utility service providers should also be sought.

2

The objectives of public involvement can be summarized as follows:

- informing the stakeholders about what is proposed and providing the opportunity for creating a sense of ownership of the proposal;
- providing an opportunity for those otherwise unrepresented to present their views and values, therefore allowing more sensitive consideration of mitigative measures and trade-offs;
- providing those involved with planning the proposal with an opportunity to ensure that the benefits are maximised and that no major impacts have been overlooked;
- providing an opportunity for the public to influence project design in a positive manner;
- obtaining local and traditional knowledge (corrective and creative), before decision-making;
- increasing public confidence in the reviewers and decision-makers;
- providing better transparency and accountability in decision-making; and
- reducing conflict through the early identification of contentious issues.

More intangible benefits flow from public involvement as participants see that their ideas can help to improve proposals. People gain confidence and self-esteem through taking part in the process and perceptions are expanded by meeting, and exchanging ideas and information with, people who have different values and views.

Box 1: Contribution to project design

Public involvement of affected people or local NGOs has contributed to changes in project design in numerous projects. Examples include the following:

Ghana Environmental Resource Management Project
This project seeks to improve natural resource management. Public consultations drove the entire project design process from the very beginning. Investments under the village-level land and water resource management component were entirely designed by the local communities, which diagnosed problems, developed action plans and are now responsible for implementation. A coastal wetlands component was also largely designed through local consultation. Affected communities and user groups participated in the demarcation of ecologically sensitive areas and in determining the levels of resource use and conservation in coastal wetlands.

Brazil Espirito Santo Water Project
The original design would have negatively impacted on two communities. By including these communities in the EIA process through information disclosure and consultation, satisfactory mitigation measures were achieved that counterbalanced the impacts and improved local living conditions.

Adapted from The World Bank (1995)

Ask the group how they could identify the people and groups that should be involved in a particular EIA.

People who may be directly or indirectly affected by a proposal will clearly be a focus for public involvement. Those directly affected can often be easily identified. They may be project beneficiaries, those likely to be adversely affected, or other stakeholders. The identification of those indirectly affected is more difficult, and to some extent it will be a subjective judgement. For this reason it is good practice to have a very wide definition of who should be involved, and to include any person or group who thinks that they have an interest. Sometimes it may be easier to consult with a representative from a particular interest group. In this case the choice of group representative should be left to the group itself.

Care is required to ensure that a fair and balanced representation of views is sought and that the views of the poor or minority groups are not overwhelmed by those of the more influential or wealthy.

Discuss briefly the confusing range of different terminology that is used when referring to the involvement of the public in EIA.

There is no consistent set of definitions of the terms used to describe the different types of public involvement in EIA. For instance it is common to find the terms 'consultation' and 'participation' used interchangeably by some organizations whilst being taken to mean quite different things by others. In practice these subtle differences in terminology would usually be clarified by the detailed requirements of any public involvement programme. However, it is useful to be sensitive to them when interacting with others who may have a different experience or perspective.

Outline the levels of public involvement in EIA and the relative advantages and disadvantages they offer.

The level of public involvement required for a particular proposal will depend on its social and political context. Public involvement can vary from merely informing the public about what is proposed, through consultation, to full participatory decision-making (see Box 2). While the various levels of public involvement seem quite discrete, in most EIAs the distinctions between the levels will be blurred. The processes of public consultation and public participation provide many opportunities and paths through which decision-makers become aware of the concerns of the participants, and can have a major influence on decision-making through informal means. The extreme case of full public participation in decision-making is rare because most decision-makers have a reluctance to share their decision-making power with the affected community, feeling that they (the decision-makers) have a responsibility to make decisions on behalf of the wider community.

Box 2: Levels of public involvement

- **Informing**
  3 one way flow of information from the proponent to the public
- **Consulting**
  two way flow of information between the proponent and the public
  opportunities for the public to express views on the proposal
- **Participating**
  proponent and the public involved in shared analysis and agenda setting
  involved in decision-making through reaching consensus on the main elements

Adapted from Bass et al (1995)

Ask the group to identify some techniques and methods of public involvement and suggest where each of these could be most suitably used. List these techniques and provide participants with Handout 1. Work through the different techniques and their relative advantages.

The various methods of public involvement have different intrinsic levels of involvement, as indicated in the table on the next page. It should not be inferred that methods with a high level of involvement will be always preferred—a mix of methods is usually desirable. For instance, informal small group meetings may be the best way to discuss an item of specific concern with a small group, whereas a mass media campaign involving public displays and advertising may be the best way to initially launch a public involvement programme.

The methods of public involvement used need to suit the social environment. It has been noted for instance that, although people want to be consulted, they may not have the time, resources or ability to locate EIA information and report their views to the relevant authorities. Traditional local decision-making institutions and the use of the mass media (such as television, radio and papers) may be far more appropriate than placing reports in local libraries as has been the normal process in a number of EIA systems.

Techniques for communicating with the public

Communication Characteristics				Public Information and Participation Objectives					
Level of Public Contact Achieved	Ability to Handle Specific Interest	Degree of 2-way Communication	**Public Participation / Communication Techniques**	Inform/Educate	Identify Problems/Values	Get Ideas/Solve Problems	Feedback	Evaluate	Resolve Conflict/ . Consensus
2	1	1	Public Hearings		X		X		
2	1	2	Public Meetings	X	X		X		
1	2	3	Informal Small Group Meetings	X	X	X	X	X	X
2	1	2	General Public Information Meetings	X					
1	2	2	Presentations to Community Organization	X	X		X		
1	3	3	Information Coordination Seminars	X			X		
1	2	1	Operating Field Offices		X	X	X	X	
1	3	3	Local Planning Visits		X		X	X	
2	2	1	Information Brochures and Pamphlets	X					
1	3	3	Field Trips and Site Visits	X	X				
3	1	2	Public Displays	X		X	X		
2	1	2	Model Demonstration Projects	X			X	X	X
3	1	1	Material for Mass Media	X					
1	3	2	Response to Public Inquiries	X					
3	1	1	Press Releases Inviting Comments	X			X		
1	3	1	Letter Requests for Comments			X	X		
1	3	3	Workshops		X	X	X	X	X
1	3	3	Advisory Committees		X	X	X	X	
1	3	3	Task Forces		X	X		X	
1	3	3	Employment of Community Residents		X	X			X
1	3	3	Community Interest Advocates			X		X	X
1	3	3	Ombudsman or Representative		X	X	X	X	X
2	3	1	Public Review of Initial Assessment Decision Document	X	X	X	X	X	X

Level of participation: 1 = low, 2 = medium, 3 = high.

4

There are a number of basic principles that can be followed to help ensure a successful outcome when using public involvement techniques:

- sufficient relevant information must be provided in a form that is easily understood by non-experts (without being simplistic or insulting);
- sufficient time must be allowed for stakeholders to read, discuss and consider the information and its implications;
- sufficient time must be allowed to enable stakeholders to present their views;
- responses should be provided to issues/problems raised or comments made by stakeholders. This enables public confidence in the public involvement and the EIA process to be maintained; and
- the selection of venues and the timing of events should encourage maximum attendance and a free exchange of views by all stakeholders (including those that may feel less confident about expressing their views).

Emphasise the importance of early planning for a public involvement programme. Discuss different ways in which the programme, and people's participation in it, can be funded.

Planning by the proponent for a public involvement programme needs to begin before any other work is carried out on the EIA. Otherwise, once work commences on the technical aspects of the process it can be difficult for the EIA team to focus on other aspects (even when there is a social scientist on the team). Where there are Terms of Reference [ToR] for the proposal they should include an outline of the proposed programme detailing the scope, timing, techniques and resources for the interaction. If there are no ToR, or it is not possible to integrate a programme into them, then it is best if a separate document is prepared by the EIA team leader with advice and input from a social scientist who has knowledge of the local cultures and participation techniques.

The plan will detail means of informing the public about the study process, objectives and proposals at an early stage; ways in which the public will be informed about progress with the study and feedback on community concerns; and ways in which the public will be encouraged to become involved in sharing their knowledge, values and concerns. It will also detail the resources (people and money) available to support the plan. In this respect, some money may be allocated specifically to assist the community to contribute to the study (eg. to defray travelling costs, to recompense community representatives for time spent on their involvement, and to allow representatives to report back to their constituents). Money should also be provided to hold meetings and inquiries within the local community.

5

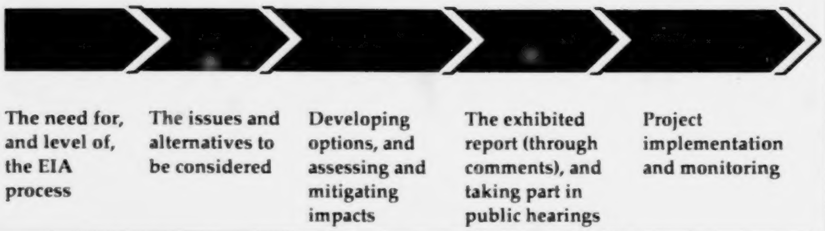
The development of a public involvement programme would typically involve consideration of the following issues:

- the objectives of the EIA;
- identification of interested and affected parties (stakeholders);
- budgetary/time constraints and opportunities;
- identification of appropriate techniques to involve or consult with the stakeholders;
- traditional authority structures and decision-making processes;
- identification of approaches to ensure feedback to the involved stakeholders; and
- identification of mechanisms to ensure consideration of stakeholders' views, opinions and suggestions.

Ask the group to identify the stages of the EIA process in which public involvement should occur. Develop the responses through discussion, to show how public involvement can be used throughout the EIA process.

Ideally, the public involvement programme should commence at the screening stage of a proposal and then continue throughout the whole EIA process. This is represented in the diagram below produced by The World Bank to show how public involvement is incorporated into its procedures.

6


The need for, and level of, the EIA process
The issues and alternatives to be considered
Developing options, and assessing and mitigating impacts
The exhibited report (through comments), and taking part in public hearings
Project implementation and monitoring

From The World Bank (1995)

Screening

EIA authorities may consult with people likely to be affected by a proposal in order to understand more clearly the nature and significance of the likely impacts. This information will assist in screening to determine if EIA is required and, where there are a range of levels within the EIA system, the appropriate level.

Scoping

Public involvement is commonly undertaken at the scoping stage, in order to ensure that all the significant issues are identified, local information about the project area is gathered, and alternative ways of achieving the project objectives are considered.

Assessing and mitigating

The further involvement of the public in these phases of the EIA preparation (which are often iterative in nature) can help to avoid biases and inaccuracies in the analysis, can reveal local values and preferences (allowing a more informed analysis of impacts and options), and can assist in the consideration of mitigating measures which will be incorporated into the favoured alternative(s).

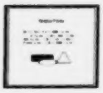
Exhibition and reviewing

When EIA reports are exhibited for comment, a further opportunity for public involvement is provided. Making written comments is daunting to all but the most educated and articulate, and other means of achieving responses should be provided. Public hearings are often held at this stage, and can be structured in a formal or informal manner to enable affected people to have their say.

Implementing and monitoring

Following project approval, the detailed design, construction and operating phases proceed. Increasingly, it is realised that the evolution of projects through these phases, and in combination with other changes and developments, can present environmental challenges which require adaptive management. An emphasis on environmental management, and the participation of local representatives in the monitoring process, can assist proponents and approval agencies to respond to problems as they arise. Such interaction with local communities will also promote good relations between a development and its neighbours, to the benefit of all.

Outline the factors which need to be taken into consideration in ensuring effective public involvement.[3]



7

There are a number of potential constraints to effective public participation. These include:

Poverty	involvement means time spent away from income-producing tasks, and favours the wealthy.
Rural settings	increased distances make communication more difficult and expensive.
Illiteracy	which may be combined with the lack of command of non-local languages, can inhibit representative involvement if print media is used.
Local values/culture	behavioural norms or cultural practice can inhibit involvement of some groups, who may not feel free to disagree publicly with dominant groups.
Languages	in some countries a number of different languages or dialects may be spoken, making communication difficult.
Legal systems	may be in conflict with traditional systems, and cause confusion about rights and responsibilities for resources.
Interest groups	may have conflicting or divergent views, and vested interests.
Confidentiality	can be important for the proponent, and may militate against early involvement and consideration of alternatives.

Discuss consensus building and dispute resolution mechanisms.

Conflict management and resolution approaches must be consistent with local practices:

> The objective is to define traditional mechanisms for making agreements, for negotiations, and for managing conflict in affected communities. Understanding and working within cultural expectations and practices may enhance consultation and participation processes, especially in projects where there are multiple and competing stakeholders or where disputes or conflict are evident. *(The World Bank, 1995)*

It may be possible to plan and implement a proposal without conflict, providing the involvement of all stakeholders is sought at the earliest stage of the proposal, and their interests are understood and met. Identification of the various stakeholders and sensitivity to their interests will assist in finding consensus. In most cases, however, the range of interests and the different values of the participants will mean that consensus is unlikely. There are some general principles which, if applied, can minimise the areas of dispute, and focus attention on those key issues that cannot be resolved. Resolution in these areas will then involve 'winners' and 'losers', through a decision-making process which may be political, or may involve arbitration.

8 Principles which will minimise conflict, particularly if applied consistently from the earliest stages of the planning of the proposal, include:

- involving all those likely to be affected, or have a stake in the matter;
- communicating the objectives of the proposal, and how it is planned to achieve them;
- actively listening to the concerns of affected people, and the interests which lie behind those concerns;
- treating people honestly and fairly, establishing trust through a consistency of behaviour;
- being empathetic, putting yourself in the shoes of the other party, and looking at the area of dispute from their perspective;
- being flexible in the way alternatives are considered, and amending the proposal wherever possible to better suit the interests of other parties;
- where others' interests cannot be accommodated, mitigating impacts to the greatest extent possible, and looking for ways to compensate for detriment;
- establishing and maintaining open two-way channels of communication throughout the planning phase, and beyond into implementation; and
- acknowledging the concerns and suggestions of others, and providing feed-back on the way these matters have been followed up and evaluated.

Where conflict arises, try to defuse it at the earliest possible time. The use of an independent, mutually acceptable third party as the convenor of discussions between disputants can improve the chances of satisfactory outcomes. It is desirable for that third party to be trained in the principles of negotiation or mediation, and to be able to assist the parties in dealing with the feelings, facts and process issues associated with the dispute.

There are many reasons put forward as justification for avoiding public involvement. As a group, identify and discuss some of those commonly used.

9 Most of the risks associated with public involvement can be avoided with sound planning. Perhaps more importantly, the lack of consultation and participation may pose a much greater risk to projects in the long term. Some of the common 'reasons' that are put forward as justification for avoiding public involvement are given below:

It's too early; we haven't yet got a firm proposal	The early provision of information to the public will minimise the risk of untrue and damaging rumours about the proposals. Even though the proponent may not have a clear idea of project details, communicating the objectives of the proposals will start to build trust with the community, and can allow useful public input on site constraints and alternatives. The trend in EIA is to undertake public involvement in the feasibility stage when options are still being considered, so that the community concerns can help the proponent devise a robust scheme.

It will take too long and will cost too much	Public involvement can be expensive and time-consuming. If integrated into the project planning, excessive timelines can be avoided. The costs of not involving the public are likely to be even greater in terms of costs arising from delays, and projects which do not achieve their aims.
It will stir up opposition, and the process will be taken over by activists	Those who are likely to oppose a project will not be dissuaded by the lack of a public involvement programme. Such a programme can, however, ensure that all sides of the debate are heard. Importantly, the issues raised by opponents should be thoroughly examined, and treated on their merits. If the impacts cannot be avoided, and the project is considered necessary for other compelling reasons, the public involvement programme should demonstrate to all that the concerns of segments of the community have been fairly treated.
We will only hear from the articulate	Those who are articulate, knowledgeable and powerful find it easier to use the opportunities provided through public involvement. Those preparing and managing such programmes must be aware of this, and incorporate measures to ensure that the views of 'the silent majority' are expressed and understood.
We'll raise expectations we can't satisfy	Great care must be taken in the first phases of a public involvement programme to ensure that unreasonable expectations are not raised. Decisions which have already been made, and which foreclose options, should be communicated at the earliest possible date. The purpose of the community involvement, the study process, and the decision making process, should all be clearly communicated.
The local community won't understand the issues involved.	Lack of technical education does not negate intelligence and the understanding people have of their own surroundings. Often people's knowledge of their environment and how it will react to change can be more accurate than that predicted by models.

Briefly conclude with a reference to the spirit of openness required by proponents if public involvement is to be beneficial.

No public involvement programme will be effective unless the proponent genuinely wishes to engage in a two-way dialogue with the community. This spirit of openness needs to embrace a willingness to listen to the information, values and concerns of the community, to amend the proposal so as to minimise community concerns, and to acknowledge the value of community input.

Include a training activity to reinforce the topic (if desired).

Summarize the presentation and preview the next topic

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Scott, (1991) *The Quality of Environmental Decision Making; Principles and Practice of the Victorian Land Conservation Council.* Melbourne

2. The World Bank (1995) *Public Involvement in Environmental Assessment Requirements, Opportunities and Issues.* Environmental Assessment Sourcebook Update Number 5. The World Bank. Washington

3. Boyle, J. and Mubvami, T. (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe.* Department of Natural Resources, Ministry of Environment and Tourism. Zimbabwe

African High-Level Ministerial Meeting on Environmental Impact Assessment (EIA) Durban, South Africa (1995) Communique, United Nations Environment Programme

Bass, S. Dalal-Clayton, B. and Pretty, J. (1995) *Participation Strategies for Sustainable Development.* IIED. London

Bishop, A.B. (1973) *Public Participation in Environmental Impact Assessment.* Paper presented at Eng Foundation Conference on Preparation of Environment Impact Statements. New England College. Henniker. New Hampshire USA.

Bisset, R. (1996) *EIA: Issues, Trends and Practice.* Environment and Economics Unit. UNEP. Nairobi

Onorio, K. and Morgan, R. K. (1995) Incountry EIA training in the South Pacific, An Interim Review and Evaluation of the South Pacific Regional Environment Programme's EIA Program. *Impact Assessment* vol 13. no 1. pp 87–100

The World Bank (1995) *Environmental Assessment Challenges and Good Practice.* Paper No 018. Environmental Management Series. Washington.

Further reading

Asian Development Bank, Office of the Environment, Module 19

Department of Planning and Development, Victoria (1995) *Environment Effects Statement Consultative Committees: Guidelines for Operation and Membership.* Melbourne

Fisher, R. and Ury, W. (1981) *Getting to Yes: Negotiating Agreement Without Giving In.* Houghton Mifflin. Boston

Sadar, M.H. and Associates (1995) *Environmental Impact Assessment.* Carleton University Press. Ottawa, Canada.

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment.* CEAA and IAIA. Canada

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

3–1 A large dam is proposed in a rural setting. What public involvement techniques might be used to support the EIA for the project? How would it change if the project was a major chemical plant in a large city?

3–2 How would you go about identifying the range of people affected directly or indirectly by a proposal? How would representatives of the groups identified be selected?

3–3 What are the needs and interests of the affected community that make their involvement so important to them? Is their involvement as important for the proponent?

3–4 'Public involvement should take place at the scoping stage of a proposal, and when the EIA document is completed.' Does this statement satisfy the requirements for community involvement?

3–5 People feel more comfortable in familiar surroundings. Where should the venues and locations for discussions, small group meetings, public meetings and displays be sited? How will the setting and other meeting arrangements contribute to the success of an interaction?

3–6 What are the objectives of public involvement? What value will it bring to the successful implementation of the proposal?

3–7 What criticisms of public involvement can you expect, and how can these criticisms be answered?

3–8 How would you attempt to manage conflict when it arises? If you were looking for someone to help, what qualities would you seek in that person?

Speaker theme

3–1 Invite a speaker who is expert in the field to talk about their own personal experience in public involvement on major projects. How much did a typical involvement programme cost, what techniques were used, how effective were they? Did people respond positively, were there changes made to the proposal? Was the proponent supportive of the public involvement programme? What lessons were learnt from the experience?

Group Activity 3-1: Public Involvement

Title	**Preparing a public involvement programme**
Aim	To reinforce the training material presented through the preparation of a public involvement programme, and consideration of the associated issues.
Group size	Four to six people
Duration	One day

Resources required

- Case study description of a proposal, with some details of its likely impacts and setting.

Description of activity:

Participants will be required to think through the various issues, and relate the tasks involved to the objectives of the public involvement. Using the case study:

- prepare a public involvement programme, showing the objectives of the programme, and the stages at which public involvement will be sought;
- indicate how the various stakeholders will be identified, and how representatives can be chosen;
- advise when the public involvement should commence, and what information should be supplied;
- list the methods which might be used to:
  - inform people
  - find out their concerns, attitudes and knowledge
  - enable them to participate in developing the proposal;
- prepare a timetable for the programme, indicating the resources (people and money) which will be needed;
- outline ways to ensure that information gained from the involvement of the public is used constructively to improve the proposal;
- identify problems which are likely to occur, and ways of managing them; and
- prepare an evaluation framework for the success of the programme.

Group Activity 3-2: Public Involvement

Title	**Site location decisions — what are the facts?**
Aim	To show how public involvement can assist in deciding between alternative sites and in achieving public acceptance of a proposal.
Group size	Four to six people
Duration	Three hours

Resources required

- A brief description of the need for a facility that has two possible alternative locations, a list of the likely impacts, and a description of the surrounding communities.

Description of activity:

The alternative sites for a facility affect different communities, and will involve some land acquisition. Get each group to:

- discuss how they would structure the public involvement to minimise conflict, while allowing informed debate on the respective merits of the proposals;
- propose steps that could be taken to pre-empt rumours and distortions about what may be proposed;
- given that opponents often appear to have a biased view of the basic facts relating to the proposal and the need for action, outline ways in which a shared view of the basic facts could be reached;
- detail the sort of information that would be required by the decision-maker before a decision could be made; and
- as a whole group discuss the way in which the public involvement would assist the project.

1

Typical stakeholders

- local people
- proponent and project beneficiaries
- government agencies
- NGOs
- others, eg donors, the private sector, academics

2

The objectives of public involvement:

- informing stakeholders
- presentation of views, concerns and values
- maximising benefits
- influencing project design
- obtaining local knowledge
- increasing public confidence
- better transparency and accountability in decision-making
- less conflict

3

Levels of public involvement

- Informing
  (one way flow from proponent to public)
- Consulting
  (two way flow of information, opportunities for the public to express views)
- Participating
  (proponent and the public share analysis and agenda setting, public involved in decision-making through consensus)

4

Principles for successful public involvement:

- provide sufficient relevant information
- allow sufficient time to read and discuss
- allow sufficient time to present views
- provide responses to issues/problems raised
- choose venues and times of events to suit stakeholders

5

Developing a public involvement programme typically involves:

- meeting the objectives of the EIA
- identifying interested and affected parties (stakeholders)
- meeting budgetary/time constraints and opportunities
- identifying appropriate techniques
- considering traditional authority structures and decision-making processes
- identifying approaches to facilitate feedback
- identifying mechanisms to consider stakeholders' views, opinions, suggestions.

6

Stages of the EIA process when public involvement may occur.

Screening	the need for, and level, of the EIA process
Scoping	the issues and alternatives to be considered
Assessing and Mitigating	developing options, and assessing and mitigating impacts
Reviewing	commenting on the exhibited report, and taking part in hearings
Implementing and Monitoring	project implementation and monitoring

---

7

Factors affecting the effectiveness of public involvement

- poverty
- rural settings
- illiteracy
- culture/local values
- languages
- legal systems
- interest groups
- confidentiality

8

Minimising conflict

- involve all stakeholders
- communicate the objectives of the proposal
- listen to concerns and interests of affected people
- treat people honestly and fairly
- be empathetic
- be flexible
- mitigate impacts, and compensate for detriment
- establish communication channels
- acknowledge concerns and provide feed-back

9

Common reasons given for avoiding public involvement

- It's too early
- It will take too long and will cost too much.
- It will stir up opposition
- We will only hear from the articulate.
- We'll raise expectations
- People won't understand

PUBLIC INVOLVEMENT IN ENVIRONMENTAL ASSESSMENT: REQUIREMENTS, OPPORTUNITIES AND ISSUES

World Bank Environmental Assessment Sourcebook Update. The World Bank. Washington
October 1993, Number 5

The Bank's Operational Directive (OD) 4.01 on Environmental Assessment (EA) requires that affected groups and local NGOs be informed and consulted in a meaningful way as part of EA preparation (para 21). ***Information disclosure*** *is a prerequisite for meaningful consultation. Proper* ***consultation*** *is a requirement for EA category A projects but is also useful for other projects as it helps (1) improve understanding of the potential impacts of proposed projects; (2) identify alternative sites or designs, and mitigation measures, to improve environmental and social soundness; (3) clarify values and trade-offs associated with these different alternatives; (4) identify contentious issues; (5) establish transparent procedures for carrying out proposed projects; and (6) create accountability and a sense of local ownership during project implementation. Public* ***participation*** *in project preparation, beyond consultation, is not an EA requirement except when a project involves involuntary resettlement or affects indigenous people; but public participation in decision-making strengthens local ownership and accountability.*

This EA Sourcebook Update describes information disclosure, consultation and participation requirements in the EA process. The focus is on practical information, from descriptions of categories of affected people and their representatives to innovative techniques for the use of social scientists. The Update replaces the EA Sourcebook's Chapter 7, Community Involvement and the Role of Nongovernmental Organizations in Environmental Review, and can be inserted into Chapter 7 of the Update Binder.

TYPES OF PUBLIC INVOLVEMENT

Public involvement in planning and implementing projects can be brought about through consultation and participation. The key factor that distinguishes consultation from participation is the degree to which those involved are allowed to influence, share or control decision-making. The World Bank requires consultation with affected groups and local NGOs as part of the EA preparation process. Participation is required during project preparation under certain conditions and is generally recommended as part of implementation. Information dissemination is a necessary precondition for consultation and participation. Figure 1 describes these events in relation to the Bank project cycle and EA process.

Information Dissemination

OD 4.01 states that "[in] order for meaningful consultations to take place between the borrower and affected groups and local NGOs, it is necessary that the borrower provide relevant information prior to consultations. The information should be provided in a timely manner and in a form that is meaningful for, and accessible to, the groups being consulted (para 21)." For the first round of consultations (see Figure 1) the information normally includes a summary of the project description and objectives, and the potential negative impacts from the proposed project.

Once the EA report for a category A project has been prepared, "a summary of its conclusions in a form and language meaningful to the groups being consulted (para 21) should be disclosed to the consulted parties. According to the same paragraph, "[any] consultation should pay particular attention to those issues most likely to affect the people being consulted. In addition, the borrower should make the EA report available at some public place accessible to affected groups and local NGOs for their review and comment."

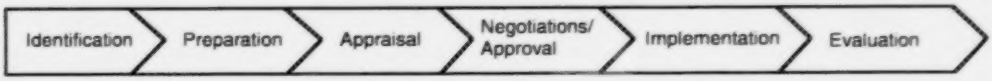
In developing countries, an effective information disclosure strategy should not assume that people have the time, willingness, organization and resources to find EA information and make their views known to relevant authorities. Experience indicates that placing project descriptions and EA reports in public libraries does not reach the vast majority of people. Mass media, including local television, radio, newspapers and leaflets in local languages, are important means to reach those who will be affected. In some cases, particularly in Africa, the Bank has recommended that EA consultants and implementing agencies work through local traditional decision-making institutions and leaders to disseminate information. Information dissemination normally incurs costs, hence decisions need to be made regarding strategy and funding at an early stage. It is recommended that EA reports document these decisions.

Figure 1. Public Involvement in Environmental Assessment

The EA Process

Environmental screening	Scoping Bank and Borrower agree on EA TORs and schedule	Draft EA submitted for review and clearance; findings discussed with Borrower and worked into project documents	Appraisal team discusses remaining issues with Borrower	Finalization in loan agreements of environmental items, based on EA findings	Environmental supervision based on EA and loan agreements	Evaluation of environmental aspects in completion and evaluation reports

Project Stages



Public Involvement

Bank and Borrower discuss extent and mode of disclosure, consultation and - as appropriate - participation. Identification of affected groups and local NGOs and meaningful ways to disseminate information	Information on project and its potential impacts released Affected groups and relevant local NGOs fully identified; Bank and Borrower agree on extent and mode of consultation and participation. Public consultation	Main findings of draft EA report made available to affected people and local NGOs. Consultation about EA report. Consultation process including views, agreements and participants recorded in final EA report	Appraisal team ensures that concerns are addressed in project design and mitigation plans Participation plans developed - as appropriate - for implementation and evaluation	Results of consultation and participation reflected - as appropriate - in loan agreements	Transparency in implementation of EA recommendations and - as appropriate - participation by local NGOs and affected groups	Post-hoc evaluation, including reflection of affected peoples' views about project impacts

Consultation

Consultation involves soliciting people's views on proposed actions and engaging them in a dialogue. Unlike information dissemination, consultation is characterized by two-way information flow, from project authorities to people, and from people to project authorities. While decision-making authority is retained by governments, interaction with people and eliciting feedback allows affected populations to influence the decision-making process by raising issues that should be considered in scoping; project design; mitigation, monitoring and management plans; and the analysis of alternatives.

OD 4.01 requires consultation with affected groups and local NGOs during at least two stages of the EA process: (1) shortly after the EA category has been assigned, and (2) once a draft EA has been prepared. In projects with major social components, such as those requiring involuntary resettlement, consultation on social issues and on EA should be ed. Increasing use is being made of regional EAs and sectoral EAs, and it is important the consultative process also be integrated with them (see *EA Sourcebook Update No. 4: oral Environmental Assessment*).

view of Bank experience found that while an increasing number of EAs involved ultation with NGOs, consultation with local communities was more limited. Women the poor were seldom reached except in the case of resettlement and when indigenous ples were involved. When consultation had taken place, documentation of the process in reports was often incomplete. Bank staff reported they felt constrained by lack of in-ntry legislation, guidance, techniques and capacity for undertaking consultation; ever, staff also felt that consultation, when carried out, improved project design, ronmental soundness and social acceptability.

sultation during EA scoping. Scoping involves consultation to identify key issues and evelop EA Terms of Reference (TORs) (see Box 1). In the past, TORs were typically eloped by the relevant government department in consultation with the donor agency. 4.01 recommends that other government departments, local NGOs and affected groups icipate in the discussions that lead to preparation of TORs for the EA. This usually rs after a preliminary government inter-agency meeting that determines the parameters e consultation process. Draft TORs are then disseminated, and follow-up meetings are to discuss changes and additions to the issues already identified. In many cases, ncial resources must be made available to the smaller NGOs and to community esentatives to enable their travel to the meetings.

sultation during EA preparation. Many EAs involve consultation with affected people ng the EA process (see Box 2). The most common method of contact with directly cted populations has been through surveys. These have often been undertaken in the ext of resettlement or when indigenous peoples would be affected.

lic consultation during EA preparation can help clarify misconceptions and enhance al acceptability. In a sewerage project in Cyprus, consultations helped allay concerns ut odors from a treatment plant, and the relationship between the construction of the t and future roads.

ide range of people, including national, provincial and local officials, NGOs, private ness groups and community people, were consulted in the Berke Hydropower Project in key. Each group had different concerns. Local officials raised the issue of their inability eet the increased demand for public services, and emphasized the importance of a local mal spring for tourists; local people drew maps of their travel paths and roads, and ed concerns about which ones would be flooded. The consultations clarified conceptions regarding the project and its impacts; and also provided the EA consultants important information for the mitigation plan.

reparation of the Arun III Hydro-electric Project in Nepal, the largest development ect undertaken in that country, over 35 different organizations (international, national local), as well as local businessmen, traders, foresters, bankers and women were sulted. Workshops were held at the district and local level. The consultation process was rded using video film and written documents. Consultations resulted in (1) changes in location of the access road; (2) proposals for community-based forestry user groups that ld safeguard the valuable timber resources of the area; and (3) agricultural extension grams to assist villagers in capitalizing on livestock production opportunities provided etter access to markets.

Box 1. Malawi: Consultation at Scoping

The Malawi Power V project conducted a two-day scoping seminar involving government officials, NGO representatives and technical specialists to present the aims and activities of the proposed project. The participants were divided into three groups to discuss the main issues: terrestrial, aquatic and social. Each group listed and ranked the positive and negative impacts of the proposed project activities, and then returned to the plenary session to set priorities together for the most important activities and impacts. This discussion provided focus for preparing the EA TORs by helping to clarify priority areas of concern. It also helped build knowledge and consensus up front on what aspects the EA would address, thus reducing the risk of conflict and of raising issues later in the EA process.

Consultation about draft EA report. Consultation on the draft EA report for category A projects is mandated by OD 4.01 and is one of the most important elements of the EA process.

Those consulted should be allowed sufficient time to review and prepare comments on the draft EA conclusions before consultation takes place. A combination of seminars, simply written materials, visual representation, videos and scale-models are useful to decode the technical language of EAs and make them understandable to non-specialists.

So far, NGOs and specialists have been involved more often than local communities at this stage. In Latin America and the Middle East, consultation is typically conducted through public hearings; in Africa, it is more likely to be through mass media, particularly radio and the press. For example, radio has been used to engage traditional community leaders in consultations, thus ensuring at the same time that a large number of their communities were reached. The findings from these consultations can lay the groundwork for the participation plans that would involve affected groups and NGOs in further project preparation and implementation (e.g., monitoring) .

Participation

Participation is a voluntary process in which people, including marginal groups (poor, women, indigenous, ethnic minorities), come together with project authorities to share, negotiate and control the decision-making process in project design and management. The process invites a greater degree of involvement in decision-making by affected people than consultation; but like consultation, it is based on two-way flow of information and ideas. To establish and sustain the process as long as needed usually calls for social science expertise, outreach personnel and resources.

Box 2. Gabon: Local Consultation and Project Modification

Dense tropical forests cover 85% of Gabon's territory, and their high biodiversity includes more than 100 tree species of potential commercial value. Total dense forest cover is estimated at 22 million hectares. The Gabonese Government, with the assistance of the World Bank, has initiated a forestry project to (1) maintain the ecological balance and long-term productive potential of the Gabonese forests; and (2) increase the contribution of the forestry sector to national economic development and public welfare through rational management and conservation of the existing forest resources.

To attain the above objectives, the project design process was made highly participatory, involving most segments of society and including a three-year attitude survey. Responsibility for designing the project was placed on both key sectoral ministries and on the local institutions, local and foreign environmental NGOs, donors, private sector and village groups in the project area. The local media (press and national radio), seminars, and large public meetings were used to invite and make sure that all interested parties could comment on the project design, viability, and content. This approach led to (1) a comprehensive identification of environmental and social issues, and (2) internalization of responsibility for the project at all levels of society.

Project design also changed significantly. For example, while poaching control systems are necessary, new wildlife reserves and conservation areas are to be created as a counterweight measure. This will be done in close collaboration with local NGOs and the World Wildlife Fund. Another result of the consultations is extension courses on natural resource management for local people.

Box 3. Project Types and Issues Triggering Public Participation

Projects affecting indigenous peoples. Indigenous peoples are tribal groups that commonly subsist on hunting, gathering and primitive rotation agriculture. They may also reside in areas where sedentary agriculture is dominant, and be engaged in wage labor or small-scale market-oriented activities. Indigenous peoples live in diverse climates, such as in tropical and temperate forest, mountains, deserts, or savannahs. Projects affecting these groups can therefore be of multiple types and locations. When EA is needed, indigenous peoples should be consulted as part of the EA process and special Indigenous Development Plans designed with their participation. (see OD 4.20).

Projects requiring involuntary resettlement. Involuntary resettlement may be necessary in conjunction with virtually any type of major construction works or conversion of land, when people live on the sites to be converted under the project. Public participation in project preparation and resettlement planning is required under OD 4.30. When EA is required, participation by those to be resettled is needed in the EA process (e.g., in planning and implementation of mitigation, management and monitoring).

Projects for specific beneficiary groups. Such targeted groups may be the poor, indigenous people, women's associations, users' associations, or cooperatives. Under these circumstances, and when EA is required, participation by the beneficiary group concerned is essential in project design and implementation.

Projects with community-based development. When projects depend on local responsibility to be successful, participation in decision-making is important. Examples of such projects include rural infrastructure, urban low-income housing and infrastructure, community-oriented natural resource management, biodiversity conservation projects with buffer zone development, community-based forestry, and certain types of small-scale credit operations.

The Bank requires the participation by affected people in project preparation when the project affects indigenous people (OD 4.20) or involves involuntary resettlement (OD 4.30) (see Box 3). While OD 4.01 does not mandate participation, experience worldwide demonstrates the importance of participation in establishing local ownership and achieving positive developmental impact. EAs are therefore gradually moving toward increased involvement of local people, with some including representatives of affected people directly in the decision-making processes.

Participation in decision-making takes different forms during different stages of the project cycle. Consultation during EA scoping lays the groundwork for participation in project preparation or implementation. Participation during project preparation can occur through the development of TORs for the EA, and in conducting the EA. During project implementation, local NGOs or representatives of affected groups may participate in monitoring and in evaluating the measures recommended by the EA (see Box 4). In the case of the Dahanu Thermal Power Project in India, local NGOs will be monitoring atmospheric emissions.

Box 4. Ecuador: Advantages of Consultation and Participation

The Lower Guayas Flood Control Project, which is currently under implementation, provides flood control and drainage for the Lower Guayas Basin. Due in large part to extensive consultations during EA preparation with local NGOs, a national NGO and local scientific expertise, the project design was significantly altered during project preparation, to better safeguard important and sensitive habitats. The consultations produced three distinct results.

(1) the project proponent was persuaded to change the alignment of flood evacuation canals, despite higher costs, in order to save an important wetland area from severe disruption;

(2) a proposed single large outlet from a new reservoir into a river was changed, in collaboration with the consulted parties, to a multi-outlet design, after the NGOs successfully argued that the outlet would damage mangrove forests in the estuary; and

(3) a plan for continued information dissemination, consultation and participation during project implementation was developed, giving local NGOs an important role in monitoring implementation and its impacts on the natural environment.

WHO SHOULD BE INVOLVED

Knowing who are the affected groups and relevant NGOs is a vital step in meeting the Bank's consultation requirement. Groups that are directly affected should be involved early in the project cycle and should generally have the most extensive involvement. As the degree of impact diminishes, the frequency of consultation and participation and the duration of involvement may diminish as well.

Directly Affected Groups

One of the most difficult parts of the consultation process is ensuring that the affected groups are identified and adequately included. Directly affected groups include (1) intended beneficiaries of a project, (2) at-risk groups, and (3) stakeholders. They may be in physical proximity to the project or fall within its area of influence. Depending on the type and location of the project, an affected group could be a few hundred indigenous forest dwellers spread out over a vast territory or thousands of people living in one neighborhood of an industrial city. They may be dispersed in several villages and have different ethnic or religious backgrounds, or they may be only the women in a distinct community.

When considering whom to involve in consultations, project proponents must try to predict the project's potential impact on the lives of particular groups. They should evaluate the impacts on each group, according to the (1) scope or extension (both the numbers and the percentage of the total potentially affected population); (2) magnitude or intensity; (3) duration; and (4) reversibility. Because this is sometimes difficult to evaluate during the early stages of project preparation, a flexible approach is desirable so as to allow adjustments to be made, as needed, in the range of groups taking part in the process.

In some situations, affected groups may have difficulty voicing their concerns. For example, ethnic, religious, gender and racial boundaries may make it difficult for some groups to come forward. Those living in remote areas, such as indigenous peoples, may lack the necessary language skills, information, or knowledge of how to "work the system." The poor and powerless, including urban informal sector workers, may not have any, or adequate, representation. Part of the EA consultation process is to work around these barriers to make contact with affected groups.

Representatives for Affected Groups

There are generally a variety of people and organizations that act as representatives for affected people. These representatives include a wide array of individuals and groups that can provide information and act as advocates and spokesmen for their constituencies, which may be affected groups or interested parties. Examples of such representatives are:

- **public representatives**, such as state and provincial government representatives, local officials, village councils and other elected leaders;

- **traditional authorities,** such as village headmen, tribal elders, religious leaders and other clergy;
- **local organizations** (including NGOs), such as local community development or users' groups, kinship societies, recreational groups, neighborhood associations, labor unions, gender groups, ethnic organizations, cooperatives, etc.; and
- **private sector representatives**, such as private business interest groups, trade associations, or professional societies.

Cultural and political variations from one project site to another will determine which of the possible representative groups would be the most effective in communicating the views of the affected groups to the borrower. Representative groups can perform numerous roles, such as organizing the means of communication; helping plan and set goals; making resource management more efficient; and reducing the risk of protracted conflict, breakdown of consultations or harm to those involved (if the political or social situation is volatile).

Other Interested Groups

There are a wide variety of other groups that may not be affected by a project, but still have an interest in the project and its impacts. These groups should not be surrogates for local and directly affected groups, but they may have important information and resources at their disposal. Involving them early on can often help identify key concerns and opportunities, but consultation with and participation by these groups should generally be less than with affected groups. These groups may include:

- **national or international NGOs**, usually concerned with a particular issue (e.g., biodiversity conservation, family planning, technology transfer, energy conservation, agricultural development, human rights, or indigenous peoples);
- **universities, research, or training programs**, which may have expertise or a general interest in the project, its impacts and development; and
- **scientists and experts** in a particular field, whose knowledge can contribute to project development.

ELEMENTS OF EFFECTIVE CONSULTATION

The success of the consultation process is influenced by the appropriateness of the *consultation framework* and the *enabling environment* (see Box 5).

Consultation Framework

Clear agreement on "the rules of the game" at the start of the consultation process encourages respect and trust among the participants. It is therefore useful to establish during scoping, a recognized Consultation (and/or Participation) Framework for the EA process. The Framework will define the what, when, who, where and how of the consultation process. For example, the Framework should clarify what issues should be taken up with the different groups and at which stages of project planning. If the decision to carry out a project has already been made, this should be clearly stated at the onset of the process. The Framework will determine:

- the **issues to be addressed and those not under discussion**;
- the **time framework** for the consultation process (duration and times of the year);
- the **sampling of participants** (whom to include), **their legitimacy and representativeness**;

- the **setting and location** for the consultative meetings (e.g., capital cities, rural communities, town halls, market places, or centers for women's organizations);
- the **consultation methods** (e.g., mapping, models, interviews, surveys, focus discussion groups, panel discussions); and
- the **documentation and dissemination methods, including feedback to those consulted** (e.g., through leaflets, meetings, letters, and electronic and print media).

Box 5. Effective Consultation

Effective consultation is characterized by:

- wide dissemination of information before consultation begins;
- development of a Consultation Framework;
- use of two-way communication with, and wide sampling of, affected people;
- provision of feedback on results of consultation to participants;
- modification of project; and
- development of participation plans.

The setting for the consultation process is important and should create respect, familiarity and trust, so that individuals and groups feel free to talk frankly. This includes using interviewers familiar with the local culture and language, holding meetings in community halls rather than bringing people out to central places they may be unfamiliar with, or perhaps holding separate meetings for men and women or for those that are poorer than the rest of the groups.

During identification of participants for the consultation process, the Bank should consider the representativeness of units or persons within the project organization responsible for information dissemination, consultations and, as appropriate, participation. The unit or person(s) should have, or be given, the authority to make firm commitments on issues that bear directly on project design and implementation.

There are many methods available for gathering opinions and engaging people in a dialogue. Since not all of the issues are known prior to data collection, and since people are being asked to anticipate the consequences of something unfamiliar to them, at least some of the methods should be designed to encourage people to respond freely and take the discussion in directions that may not have been anticipated by the researchers.

A flexible approach to project preparation and implementation may be important, particularly in projects that require a high degree of participation. Flexibility does not mean that the projects would be designed and implemented in an ad hoc manner; instead it means that special attention should be given to setting up mechanisms for communication and feedback, and allowing for adjustments to be made over the course of preparation and implementation.

The requirement for information disclosure is also an important part of the Consultation Framework. In August 1993 the Bank revised its policies and procedures on disclosure of information generally, expanding the range of publicly available documents both locally and from Bank headquarters. Box 6 describes the implications of these revisions for EA work.

Box 6. Revised Bank Policy for Disclosure of EA Documents

Under the new policy (1993) for disclosure of information (OP 17.50 and BP 17.50), all EAs of category A projects will be made publicly available at Bank headquarters and infield offices after the borrower government releases them locally, prior to appraisal. For IDA projects, if the government objects to the release of an EA report, the project will not be appraised. For IBRD projects, the Board of Directors will decide whether or not the project will move forward in the event that the government objects.

Environmental analysis of IBRD category B projects will be summarized in the Project Information Documents (PIDs), which are factual descriptions of individual projects under preparation. PIDs will be produced for all projects that reach the IEPS stage prior to initiation of the project preparation phase. The PIDs will be made available at the Bank's Project Information Center (PIC) and updated as project preparation evolves. If separate environmental documentation is prepared for IBRD category B projects (i.e., not as part of the regular Bank project documents), borrower consent is needed on a case-by-case basis for release.

For IDA category B projects, if the environmental analysis is in a separate report, it will be made available at Bank headquarters (PIC) once it is released locally, prior to appraisal. If the borrower government objects to the release of the environmental analysis, the Country Director will decide whether to move forward with the project. If there is no separate report, the environmental analysis will be summarized in the PID, as for IBRD projects.

The Enabling Environment

Experience to date points to the importance of the following factors in carrying out effective consultation processes:

- appropriate legislative framework;
- capacity to carry out consultation;
- adequate resources; and
- social science expertise.

EA legislation. Without such a legislative framework, public participation in EA is often difficult. In Africa, countries that have prepared National Environmental Action Plans have all placed passage of EA legislation high on their policy agendas. Experience suggests, however, that well-designed projects can promote effective consultation even in the absence of specific EA legislation.

In the Philippines, environmentally critical projects must prepare an Environmental Impact Statement in order to secure an Environmental Compliance Certificate. It is the responsibility of the agency proposing a project to secure the social acceptability of a project before a compliance certificate is issued. This legislation was found to be particularly useful in the Leyte Geothermal Project, which carried out an intensive information campaign for community officials, community development officers, local universities and private sector groups.

Local capacity. Experience demonstrates the importance of local capacity to carry out consultation and participation. Countries in which effective EAs were conducted had strong national institutions that could take on the management responsibility for the consultative process, which sometimes took 6-12 months. Task managers also found that while international consultants could play a useful advisory role in setting up the process, the key players needed to be in-country. Many task managers felt the need for training, so that they could knowledgeably monitor the consultative processes being proposed and carried out by local agencies. Task managers might consider arranging joint training for their local counterpart agencies and themselves. This would enable them to monitor better and also increase the level of mutual understanding.

Adequate resources. Conducting adequate consultation will incur costs for in-country activities and for the time and travel of task managers and other project staff. The costs will vary, of course, according to the project setting and the chosen methods and intensity of consultation; but in most cases, consultation accounts for a mere fraction of total project preparation costs and a small percentage of EA preparation costs. However, exact figures usually are not available, as most borrowers do not treat consultation as a separate item. In one known case, Malawi Power V (see Box 1), the cost of consultation was approximately US$30,000.

Social science expertise. Experience also suggests the importance of drawing upon social science expertise. The EAs in Bank experience that have been conducted in more participatory ways have included social scientists on the EA teams. These social scientists were involved in the process from the beginning and contributed in the ways described fully in Box 7.

Box 7. Roles for Social Scientists

The skills of social scientists are needed to manage the EA consultation and participation process. There are four primary areas where these skills are most used: (1) identification of participant groups, stakeholders and other social groups in the project's area of influence; (2) design of consultation/participation strategies; (3) design of mechanisms for conflict management and resolution; and (4) institutional analysis.

Identification of relevant groups. The social scientist can serve a vital role in defining the key parameters about who should be consulted, including affected groups and their representatives, and how they should be consulted. Methods for this can include: social surveys, participant observation, mapping, discussion groups, interviews with authorities, and socio-cultural profiling.

Consultation/participation planning. Based on detailed knowledge of the project and the affected groups, a social scientist can design a process for consultation and participation throughout the project cycle. Who will be involved? How will their ideas be elicited? What, when, and how will decision-making authority be delegated to them? Tasks may include: defining processes for information flow, including public relations campaigns; analyzing stakeholder concerns; leading a participatory rural appraisal; and planning for and with animaters or facilitators.

Conflict management and resolution. The objective is to define traditional mechanisms for making agreements, for negotiations, and for managing conflict in affected communities. Understanding and working within cultural expectations and practices may enhance consultation and participation processes, especially in projects where there are multiple and competing stakeholders or where disputes or conflict are evident.

Institutional analysis. It may be essential to analyze the capacities of and relationships among groups involved in project design and implementation, especially in complex projects with many actors. Such analysis includes: the strengths of organizations; their ability to act as effective representatives of affected communities; and the relationships among groups, such as information flows and decision-making authority. In such projects, recommendations can simplify complex institutional structures and improve coordination.

ISSUES AND RISKS

Most of the issues and risks from having consultation and participation in projects can be avoided with sound planning. Perhaps more importantly, the lack of consultation and participation may pose a much greater risk to projects in the long run. Numerous studies of World Bank and other projects confirm that it is possible to include consultation and participation in large-scale projects without incurring substantial delays. Below is a list of the most common risks and how to avoid them.

- **Delays and excessive costs** ensue when projects have to "backtrack." Developing sound mechanisms to provide information on the project and elicit feedback early in the project cycle can avoid more costly design changes later on. Excessive costs are less likely to result when consultation (and participation) is planned and organized as part of a process.
- **Raising anxieties and expectations** prematurely may result from insufficient consultation. Unsubstantiated fears that projects may cause adverse impacts and false hopes that projects will bring benefits arise from lack of clear information. The best way to reduce this risk is to provide adequate information early on.
- **Politically volatile situations** may make consultation and participation more difficult, as people may be less inclined to speak out. Sensitivity and discretion are required where local representatives find themselves at risk when or if taking part in consultation. The safety of consulted parties should always be of utmost concern to the Bank, and the Bank should always ensure that borrowers are fully aware of this concern.
- **Capturing of development resources** by people they are not intended for can be reduced by checking whether representative and interest groups really do reflect the perspectives of affected groups. International NGOs may not accurately reflect the perceptions of their national counterparts. National NGOs may not accurately reflect local views. Developing a process that consults with each level helps to ensure that benefits are captured to a greater extent by those for whom they are targeted.

EA SOURCEBOOK UPDATE is designed to provide the most up-to-date information on the Bank's policy and procedures for conducting environmental assessments of proposed projects. This publication should be used as a supplement to the *Environmental Assessment Sourcebook,* which provides guidance on the subjects covered in Operation Directive 4.01. Please address comments and inquiries to Olav Kjørven, Managing Editor, EA Sourcebook Update, ENVLW, The World Bank, 1818 H St. NW, Washington, D.C., 20433, Room No. S-5123, (202) 473-1297.

Typical stakeholders

- local people
- proponent and project beneficiaries
- government agencies
- NGOs
- others, eg donors, the private sector, academics

The objectives of public involvement:

- informing stakeholders
- presentation of views, concerns and values
- maximising benefits
- influencing project design
- obtaining local knowledge
- increasing public confidence
- better transparency and accountability in decision-making
- less conflict

Levels of Public Involvement

- Informing
  - (one way flow from proponent to public)
- Consulting
  - (two way flow of information, opportunities for the public to express views)
- Participating
  - (proponent and the public share analysis and agenda setting, public involved in decision-making through consensus)

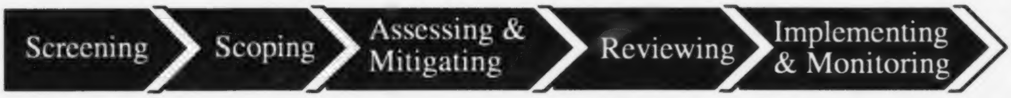
Principles for successful public involvement

- provide sufficient relevant information
- allow sufficient time to read and discuss
- allow sufficient time to present views
- provide responses to issues/problems raised
- choose venues and times of events to suit stakeholders

Developing a public involvement program typically involves:

- meeting the objectives of the EIA
- identifying interested and affected parties (stakeholders)
- meeting budgetary/time constraints and opportunities
- identifying appropriate techniques
- considering traditional authority structures and decision-making processes
- identifying approaches to facilitate feedback
- identifying mechanisms to consider stakeholders' views, opinions, suggestions

Stages of the EIA process when public involvement may occur



Screening

Scoping

Assessing & Mitigating

Reviewing

Implementing & Monitoring

• Screening	The need for, and level of, the EIA process
• Scoping	The issues and alternatives to be considered
• Assessing and Mitigating	Developing options, and assessing and mitigating impacts
• Reviewing	Commenting on the exhibited report, and taking part in hearings
• Implementing and Monitoring	Project implementation and monitoring

Factors affecting the effectiveness of public involvement

- poverty
- rural settings
- illiteracy
- culture/local values
- languages
- legal systems
- interest groups
- confidentiality

Minimising conflict

- involve all stakeholders
- communicate the objectives of the proposal
- listen to the concerns and interests of affected people
- treat people honestly and fairly
- be empathetic
- be flexible
- mitigate impacts,and compensate for detriment
- establish communication channels
- acknowledge concerns and provide feed-back

Common reasons given for avoiding public involvement

- It's too early
- It will take too long and will cost too much
- It will stir up opposition
- We will only hear from the articulate
- We'll raise expectations
- People won't understand

Topic 4—Screening

Objectives

This topic aims to:

- introduce a range of different methods of identifying activities that should be subject to EIA;
- examine the strengths and weaknesses of these methods; and
- allow course participants to gain some familiarity with the concept of significance.

Relevance

Screening determines whether or not a proposal requires detailed environmental impact assessment and, if so, at what level.

Timing

Two hours (not including training activity)

☑ Information checklist

Obtain or develop the following, as appropriate:

- ☐ a description of current screening practice (where it exists) and how it fits into the whole EIA process;
- ☐ the responsibilities and roles of the various parties in screening;
- ☐ legislation, threshold lists, environmental overviews, guidelines for assessing significance, etc used during screening;
- ☐ actual examples of screening assessments (local if possible), completed environmental overviews etc, along with the final screening decision;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/ data resource centres who may be able to provide assistance in relation to screening; and
- ☐ other resources that may be available such as videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why they are important.

This topic introduces the different ways of identifying activities that should be subject to EIA. It examines the strengths and weaknesses of the different methods and allows the participants to gain some familiarity with the idea of significant impacts.

Introduce the concept of screening. Outline the types of proposals that can require full scale environmental impact assessment, noting that this is rarely necessary. (Mention that in some EIA systems there is an overlap between the screening and scoping (Topic 5) stages of the EIA process.)

1

The process of determining whether or not an individual proposal requires 'detailed environmental assessment' (full-scale EIA) and the level of assessment that should occur is called ***screening***. Screening involves judging whether or not the expected impacts of a proposal on the environment are likely to be of significance. Most proposals can be screened very quickly (in an hour or two) and are found not to require further investigation. A small number of proposals are found to require full-scale environmental impact assessment because they could affect human health, increase pollution, or have an adverse impact on: endangered species; protected areas; fragile environments; biological diversity; social factors or the economy.

2

Full-scale EIA is typically required for proposals which involve:

- exploitation of natural resources
- infrastructure
- industrial activities
- extractive industries
- waste management and disposal, and
- substantial changes in farming or fishing practices[1]

The screening should occur as early as possible in the development of the proposal so that proponents are aware of their obligations. The reasons for screening decisions should be clearly spelt out and the procedures used should be such that if the same proposal was screened by others using the same techniques, the same decision would be reached.

The consistent and transparent use of clear screening procedures educates proponents to develop environmentally sensitive proposals and enables them to have confidence that well formulated proposals will be well received.

Discuss the different methods of screening , highlighting their advantages and disadvantages.

The choice of screening method is usually determined by the policy decision-makers when an EIA system is established. All screening methods require information about the proposal and all of them have involved the subjective use of value judgements at some stage during their development. The choice of screening method will establish the number of proposals that undergo full-scale EIA.

Approaches to screening involve one, or a combination of, the following techniques:

- 3 decision-makers' discretion;
- initial environmental examination;
- project lists with/without thresholds; and
- exclusion lists.

The responsibility for screening depends upon the method adopted. As will be seen below, where project lists exist in legislation proponents can screen their own proposals quite easily. However, where the method involves discretion, the decision-maker usually likes to be involved or have the ability to influence the outcome.

Decision-makers' discretion

This approach covers a range of situations where the need for EIA is individually assessed on a case-by-case basis. These range from the decision-maker making the screening decision alone with no outside assistance through to the decision-maker acting on advice received as the result of a structured initial review of the proposal. This review would probably be carried out according to a set of guidelines or criteria that may, or may not, include thresholds indicating significance.

The use of screening criteria requires information to be provided to, or acquired by, the body making the screening decision. This information can
4 relate to :

- the proposal itself and its potential impacts;
- the level of confidence in the predicted impacts;
- the characteristics of the receiving environment and its resilience to change;
- the existing planning, environmental management and decision-making framework; and
- the degree of public interest likely in the proposal

An example of criteria that could be used to determine the need for EIA can be found in Box 1 and the types of information that could be required when addressing these criteria can be found in Box 2.

In most cases where the impacts are likely to be significant, a visit to the site or region will be an essential part of the decision-making process.

Box 1: Criteria for the Determination of the Need for, and Level of, Environmental Impact Assessment

Character of the receiving environment

Consider:

- Is it, or is it likely to be, part of the conservation estate or subject to treaty?
- Is it an existing or potential environmentally significant area?
- Is it vulnerable to major natural or induced hazards?
- Is it a special purpose area?
- Is it an area where human communities are vulnerable?
- Does it involve a renewable or a non-renewable resource?
- Is it a degraded area, subject to significant risk levels, or a potentially contaminated site?

  NOTE: Off-site (out of area) as well as on-site (local) characteristics should be considered, where relevant.

Potential impact of proposal

Consider:

- Will implementation or construction, operation and/or decommissioning of the proposal have the potential to cause significant changes to the receiving environment? (on-site or off-site, transboundary, short term or long term)
- Could implementation of the proposal give rise to health impacts or unsafe conditions?
- Will the proposal significantly divert resources to the detriment of other natural and human communities?

  NOTE: This should include consideration of the magnitude of the impacts, their spatial extent, the duration and the intensity of change, the total life cycle and whether and how the impacts are manageable.

Resilience of natural and human environments to cope with change

Consider:

- Can the receiving environment absorb the level of impact predicted without suffering irreversible change?
- What are the implications of the proposal for bio-diversity?
- Can land uses at and around the site be sustained?
- Can sustainable uses of the site be achieved beyond the life of the proposal?
- Are contingency or emergency plans proposed or in place to deal with accidental events?

  NOTE: Cumulative as well as individual impacts should be considered in the context of sustainability.

Confidence of prediction of impacts

Consider:

- What level of knowledge do we have on the resilience of a given significant ecosystem?
- Is the proposal sufficiently detailed and understood to enable the impacts to be established?
- Is the level and nature of change to the natural human environment sufficiently understood to allow the impact of the proposal to be predicted and managed?
- Is it practicable to monitor the predicted effects?
- Are present community values on land use and resource use known or likely to change?

Presence of planning, policy framework and other decision-making processes

Consider:

- Is the proposal consistent with existing policy frameworks?
- Do other approval processes exist to adequately assess and manage proposal impacts?
- What legislation, standard codes or guidelines are available to properly monitor and control operations and the types or quantity of the impacts?

Degree of public interest

Consider:

- Is the proposal controversial or could it lead to controversy or concern in the community?
- Will the amenity, values or lifestyle of the community be adversely affected?
- Will large numbers of people require relocation?
- Will the proposal result in inequities between sectors of the community?

Based on ANZECC, 1993

Box 2: Types of information required during the screening of proposals

Description of proposal:

- name of developer/proposer
- statement of need (for infrastructure projects)
- detailed statement of what is proposed
- robustness of proposal, financial status and previous performance of proponent
- source of funding
- assessment of any feasible or prudent alternative to the proposed action, including siting options
- identification of who will benefit from the proposal and who will be disadvantaged by it
- irreversible commitment of resources
- existing land use, status and quality of site
- possible new infrastructure/social service requirements (eg power, water supply, housing, transport, education, hospital)
- expected new employment opportunities
- an indication of the proposal's potential environmental impact including duration, reversibility, level of confidence in the impact occurring (eg air, water, noise, hazards, wastes, aesthetics, health, other)
- safeguards or standards to be employed for the protection of the environment
- description of any proposed investigations or studies of the possible impacts on the environment
- a summary of any planning or work that has already occurred
- timing of construction and initial operations
- if the proposal is part of an overall programme, an indication of how it fits into the programme, and the commitment that it would make to the rest of the programme
- expected life of the proposal
- sources, quantities of raw materials and supplies
- methods of transportation during implementation/construction and operation
- list of any products to be manufactured, and estimated annual capacity

- types of process that might be used, including proposed methods of waste treatment

Description of the receiving environment and community:

- the character of the receiving environment and community (eg ecology, geomorphology, endangered species)
- the sensitivity of the actual site and the area surrounding it (eg proximity to wetlands, significant cultural areas, areas subject to treaty agreements, subject to other special purpose use, tourism)
- the vulnerability of the area to natural or other hazards, including disease
- the resilience of the area, its surrounds and its people to change
- the sensitivity of the area to physical processes (eg salinity, coastal processes)
- whether the area has been altered, degraded or contaminated
- assimilative capacity of the environment
- cumulative effects
- potential for rehabilitation, relocation, compensation
- adequacy of existing baseline data

Sustainability criteria:

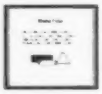
- alternative uses of natural resources
- alternative uses of the area which will be foregone
- sustainable use of renewable resources
- intergenerational equity
- transboundary or global issues such as bio-diversity
- any situations where the precautionary principle may be relevant

Other relevant information:

- potential for conflicts of interest
- relevant policies/laws/guidelines
- degree of public interest
- views of other agencies, other permits or approvals required

Initial environmental examination (evaluation)

Another approach to screening is the 'initial environmental examination' (IEE). Initial environmental examinations are low-cost environmental evaluations that make use of information already available. When full scale EIA is not required (as is usually the case), the information collated for the initial environmental examination can be used to support the environmentally appropriate planning or design of the proposal.


5

Initial environmental examinations:

- describe the proposal and examine any alternatives that might improve the environmental outcomes;
- identify and address the concerns of the local community;
- identify and assess the potential environmental effects;
- mitigate adverse effects and enhance potential benefits; and
- contain environmental monitoring and management plans.

An example of a method of initial environmental examination is the UNDP *Environmental Overview*. This can be found in the resource material at the end of this topic (Handout 4–1). 4–1

Project lists

Project lists establish a set of specific criteria that can be used to determine which projects will undergo EIA. These criteria could be based on: project sector, type or thresholds of size; the characteristics of the receiving environment or society; or a mixture of these. Frequently project lists are structured so that they identify those projects:

- requiring full scale EIA
- requiring some form of further environmental analysis
- not requiring any further environmental analysis 6

Project lists provide a consistent and predictable approach to screening for EIA. They can be adapted over time to meet proponent and community expectations as experience with EIA leads to a greater understanding of both the environment and the development context.

When developing project lists care should be taken not to adopt those established in other jurisdictions without adequate review of their suitability. Project lists are unlikely to be directly transferable without alteration as they will have been established within the development and physical context of the particular jurisdiction. For instance, uranium mining may not appear on a list which originates from an area without any uranium and a port development may not feature on a list for an area with no major waterways.

It is also preferable that there is some form of consultation between government, agencies, industry and the public during the development, or revision, of project lists (see Box 3).

Box 3: Updating a project list

In New South Wales, Australia, screening is carried out using a project list with thresholds. In 1993 this list was revised to meet the expectations of the broader community through a process of public consultation that involved government, industry and the public in a series of 22 workshops across the state, the distribution of 2000 copies of a discussion paper and the input of over 220 written submissions.

An example of a project list for screening can be found in the resource material at the end of this topic (Handout 4–2). 4–2

Exclusion lists

The use of exclusion lists is not a common approach to screening. In situations where they are used, all proposals are made subject to EIA unless they can show that they should not be. What typically happens when this approach is used is that the greater number of smaller and less significant projects are given an exemption from EIA based on project type or size.

Discuss how projects are 'referred' to the screening decision-maker, focusing on the local process.

The proponent or funding agency is usually made legally responsible for bringing proposals that could require EIA to the attention of decision-makers (referral). In some countries, individual citizens are also permitted to request that a particular proposal be screened.

The public notification of referrals and screening decisions is now becoming more common, as is the right to appeal for those who feel that an inappropriate decision has been made (either to screen or not to screen).

Briefly examine the possible outcomes from the screening process using the flow-chart of the EIA process.

7

There are usually three possible outcomes of screening processes:

- proposals which do not require additional environmental investigation because it is expected that they will not have a significant impact;
- proposals which require a limited environmental study because the environmental impacts are known and can be easily mitigated; and
- proposals which require environmental impact assessment to determine the extent and magnitude of a range of significant adverse impacts and to propose a range of appropriate mitigation, monitoring and management measures.

Certain types of proposals will often fall automatically into one of these particular categories. For instance, large power stations are nearly always environmentally significant and require EIA whereas social infrastructure proposals rarely do.

For proposals that require EIA, the next step in the process is to agree upon the issues that need to be analysed in the EIA. This process of reaching agreement on the issues to be considered is called 'scoping'. This will be dealt with further in Topic 5.

Include a training activity to reinforce the topic (if desired).

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. OECD (1992) *Guidelines on Environment and Aid: Good Practices for Environmental Impact Assessment of Development Projects.* Paris

2. The European Bank for Reconstruction and Development (1992) *Environmental Procedures.*

3. UNDP (1992) *Handbook and Guidelines for Environmental Management and Sustainable Development*. New York

ANZECC (1993) *Guidelines and Criteria for Determining the Need for and Level of Environmental Impact Assessment in Australia.* Draft Canberra

Commission of the European Communities, Directorate-General for Development, (1993) *Environment Manual Development Procedures and Methodology Governing Lomé IV Development Co-operation Projects — User's Guide.*

Further reading

Bisset, R. (1995) *EIA: Issues, Trends and Practice*. The Environment and Economics Unit UNEP. Nairobi

Cairns, J. and Niederlehner, B. R. (1993) Ecological Function and Resilience: Neglected Criteria for Environmental Impact Assessment and Ecological Risk Analysis. *The Environmental Professional.* vol. 15. p 116-124

Canter, L. W. and Canty, G. A. (1993) Impact Significance Determination – Basic Considerations and a Sequenced Approach. *Environmental Impact Assessment Review.* 13(5). p275-297

Dept of Environment Affairs. (1992) *Checklist of Environmental Characteristics.* Pretoria

Duinker, P. and Beanlands, G. (1986) The Significance of Environmental Impacts: An Exploration of the Concept. *Environmental Management.* Vol 10 no.1. pp1–10.

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Tomlinson, P. (1984) The Use of Methods in Screening and Scoping. Clarke, B. D. et al, eds. *Perspectives in Environmental Impact Assessment*. Dordrecht: D. Reidel. pp 163-194

United Nations ESCAP (1990) *Environmental Impact Assessment*. Environment and Development Series:
- *Guidelines for Agricultural Development* (ST/ESCAP/783)
- *Guidelines for Industrial Development* (ST/ESCAP/784)
- *Guidelines for Transport Development* (ST/ESCAP/785)
- *Guidelines for Water Resource Development* (ST/ESCAP/786)

UNEP Industry and Environment Office. (1980) *Guidelines for Assessing Industrial Environmental Impact and Environmental Criteria for the Siting of Industry.* Paris: UNEP.

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

4–1 What are the strengths and weaknesses of the screening techniques used in the local process?

4–2 Discuss the relative strengths and weaknesses of the following screening techniques: decision-maker's discretion; project lists with thresholds; preliminary or initial environmental evaluations etc.

4–3 Should a list be developed of projects that should always undergo EIA? How would you go about choosing the projects that should be on the list?

4–4 What are the benefits and disadvantages of making screening decisions, and the reasons for the decisions, available to the public?

4–5 What are the benefits and disadvantages of allowing an appeal process for screening decisions?

4–6 If a country's EIA policy prescribes/designates activities in terms of project type only, what are the advantages and disadvantages of also specifying projects by size (eg a reservoir or mine lease area more than a certain number of hectares)?

4–7 How can cumulative effects and/or sustainability criteria be catered for in screening decision-making?

Speaker themes

4–1 Invite a speaker who has been involved in screening projects to discuss the strengths and weaknesses of the existing local system of screening, giving examples.

4–2 Arrange for speakers representing different stakeholders in the EIA process (eg the screening decision-maker, the proponent, the public) to participate in a panel discussion focused on the strengths and weaknesses of the existing local process of screening and how it could be improved.

Group Activity 4-1: Screening

Title	**Comparison of screening methods**
Aim	To analyse and evaluate the strengths and weaknesses of different screening methods.
Group size	Four to six participants
Duration	Three hours

Resources required

- Three local case studies providing the background information used for screening the proposals.
- The screening criteria used for these proposals and one or two other sets of criteria (from donors or other countries) that can be used for comparison.
- The screening decisions on these proposals and, if possible, the reasons for these decisions.

Description of activity

Applying the different types of screening method to the three case studies, answer the following questions:

- What differences were there in the way in which the different screening processes operated?
- What further information would you have liked to have, or things that you would like to have done, before you had to make the screening decision?
- Which method was the easiest to use?
- Which method do you feel gave the most reliable answer to whether EIA was necessary or not? Why?
- What failings did each of the screening methods have?
- What could be the repercussions of these failings?
- Compare and discuss the groups' findings with the actual decision made.
- Suggest modifications that could be made to the local screening process to improve its accuracy, reproducibility, certainty of outcome and accountability .

Group Activity 4-2: Screening

Title	**Screening proposals**
Aim	Practising screening
Group size	Class or small group activity
Duration	Three hours

Resources required

- Five short case studies and associated maps.
- Background information for the proposals that could be required to support the screening decisions.

Description of activity

- Provide the class or groups with the five short case studies and ask them to screen the proposals, giving reasons for their decisions.
- Bring the groups back together after the first hour to discuss progress.
- As a group, develop a list of information which would be required in order to screen projects adequately.

The above activity would benefit from being undertaken in conjunction with a site visit to a project.

1

Screening

Screening is the process of determining whether or not a proposal requires full-scale EIA and the level at which that assessment should occur.

2

Typical proposals requiring full-scale EIA:

- exploitation of natural resources
- infrastructure
- industrial activities
- extractive industries
- waste management and disposal
- substantial changes in farming or fishing practices

3

Screening methods

- decision-makers' discretion
- initial environmental examination
- project lists with/without thresholds
- exclusion lists

4

Screening information required by decision-makers

- information about the proposal and its potential impacts
- level of confidence in impacts
- characteristics of the environment and its resilience to change
- planning, environmental management and decision-making framework
- degree of public interest

5

An Initial Environmental Examination (IEE)

- describes the proposal and examines alternatives
- identifies and addresses the concerns of the community
- identifies and assesses potential environmental effects
- mitigates adverse effects and enhances potential benefits
- contains environmental monitoring and management plans

6

Typical project list categories

- full-scale EIA required
- some further environmental analysis required
- no further environmental analysis required

7

Flowchart of the EIA process

Environmental overview (initial environmental evaluation) Operational Guidelines

Taken from UNDP, *Handbook and Guidelines for Environmental Management and Sustainable Development* (New York, 1992), part II, pages 30-39. 3

Environmental Management Tools

Four management tools to be used at each step of UNDP operations are discussed in this section.

In addition, environmental documents and related reference materials are now being produced in copious amounts. As many of these materials could be used to prepare Environmental Overviews and Management Strategies, a library-style reference system on the environment could be set up in each field office. That is, environmental information arriving at UNDP field offices could be categorized and collected in one place for staff members to be able to consult and retrieve.

Field offices that already have libraries could set up sections on the environment and encourage Programme Officers to forward all appropriate documents to this facility. Field office environmental focal points may also assist offices in assuring that environmental management processes are completed as outlined here and that environmental information flowing into the office is disseminated to the appropriate staff members, government counterparts and NGOs. Activities of the Sustainable Development Network and the Global Environment Facility should also be linked to the guidelines.

Tool 1: Environmental Checklist for UNDP Technical Cooperation

To ensure that proper consideration has been given to the environment, a checklist serves as a reminder to those participating in activity implementation (See Box 1.) These specific questions should be answered to facilitate the process of assessing whether the environmental dimension has been included.

Tool 2: Environmental Overviews

An Environmental Overview (EO) is an assessment tool that forms the basis for an Environmental Management Strategy. The aim of this short document is to provide basic information on the present environmental situation of a country or project. It will also include an assessment of how the environment might be altered if the programme or project is implemented. This tool is the simplest instrument which can be used to determine whether a proposed activity is being designed and implemented within an environmentally sound and sustainable approach. The EOs will be used in designing all UNDP activities.

All Environmental Overviews should:

- identify the main environmental opportunities and constraints that the implementation of the programme or project could bring about;
- suggest alternatives to the programme/project design that would take better advantage of potential environmental opportunities and/or mitigate likely environmental disturbances associated with the programme/project; and
- identify areas of uncertainty regarding modifications to the environment, as well as those potential social and economic conflicts that might arise if environmental changes are introduced in the programme/project area.

Whether the overview is prepared for a Country Programme or for specific projects and programmes, it should not be longer than seven pages. Box 2 (Preparation of Environment Overviews for UNDP Country Programmes [EOCs]) and Box 3 (Preparation of Environmental Overviews for UNDP-sponsored Projects and Programmes [EOPs]) contain annotated outlines of what to include in each type of overview. Only Box 3 is included in this reading excerpt.

The responsibility of preparing EOs belongs to those who are proposing a programme or project and, when appropriate, should be included in the terms of reference. This would include UNDP staff, other UN agency professionals, government or NGO counterparts and outside experts.

For the Country Programme, the EOC should be prepared at the same time the Advisory Note is being drafted. For a project or programme document, the EOP should be done before or while the Project

Formulation Framework (PFF) is being drafted but not finalised. This leaves ample time to make revisions if necessary and to incorporate mitigation measures and other environmental considerations throughout the Note or PFF. Once the EO is prepared, some of the information it contains should be incorporated into appropriate sections of the Advisory Note (eventually the Country Programme) or the actual PFF (for example, justification, objectives and so forth). The EO should also be attached as an annex to the programme/project document so that it can be reviewed by the Project/Programme Activity Committee (PAC) and the Action-Committee (AC).

Generally speaking, EOs are not based on original research, although occasionally independent research might be necessary. EOs should be developed mainly from existing information contained in country environmental profiles such as those prepared by other international organizations, academic institutions, bilateral donors and NGOs (for example, those of the World Bank and Interregional Development Banks, or the national reports prepared for the UN Conference on Environment and Development). New information should be generated only if no other details about the characteristics/functions of the local environment are available. Participatory development techniques that take advantage of grass-roots knowledge will help improve the accuracy of EOs.

An EOP should in principle be prepared for all projects from forestry to education to management training. For projects that lack any environmental factors or potential environmental components, the EOP will be limited to one page of outline subheadings with an explanation in each case as to why it is not applicable. For projects that do not have detailed EOPs, the project document chapter on 'Special Considerations' will explain in brief that no EO was created because of the non-applicability of the topic. Very few projects will fall under this category, however.

UNDP staff should use the information contained in the document as an important input to the evaluation of the proposed programmes and projects. The EOC can influence, for example, the drafting of many sections of the Country Programme.

Box 1. Environmental Checklist for UNDP Cooperation

- Has an EOC/EOP been prepared for the programme/project?
- Does the programme/project document include explicit actions to prevent and conserve the environment?
- Have the sources of environmental impact (positive and negative) been properly identified in the programme/ project document?
- Does the programme/project document include environmental mitigation measures?
- Have the potential conflicts of interest been properly addressed in the document?

Tool 3: Environmental Screening of UNDP Activities Using EOPs

EOPs contain the necessary basic information to allow those who are designing or responsible for the proposed programme/activity to decide whether the activity deserves further environmental consideration. To facilitate this, box 4 provides five main reference points to screen UNDP proposed activities. These criteria are not comprehensive, but mainly serve as a reminder for the environmental reviewer. EOCs will also be annexed to the Country Programme, and this will provide the basis for assessing the environmental performance of the programme or project over time.

After UNDP screens the EOPs, the following choices of action exist:

- Given potential environmental opportunities and/or the absence of negative environmental impacts, write the final document (incorporating the EOP) and submit it to the PAC and, if necessary, the Action Committee.
- Do not pursue the proposal further due to its potential negative impact on the environment.
- Request additional information/clarification regarding the environmental characteristics of the area where the proposed activity is expected to take place; demand elaboration of some aspects of the EOP or expansion of information regarding potential environmental impacts prior to drafting the final document.

- Introduce changes to the design presented in the PFF to eliminate or mitigate potential negative environmental impacts, or to make better use of opportunities.
- Recommend preparing an in-depth Environmental Management Strategy for the project document that would be referred to throughout the implementation of the activity.

If the screening process leads to a choice to provide UNDP support for the programme/project under consideration, the EOP should be annexed to the project document.

Tool 4: Environmental Management Strategies

An Environmental Management Strategy (EMS) is a detailed action oriented plan prepared for UNDP projects. Environmental Overviews answer the question 'what' is happening or might happen to the environment with a proposed action. Environmental Management Strategies answer the questions:

- 'how' (to improve the environment or mitigate its disturbance),
- 'when' (at what time, through the life of a project, this will be done),
- 'who' (will be accountable for implementing and monitoring environmental activities),
- 'how long' (before the results will be seen), and
- 'what is required' (in terms of experts, information, institutional and financial support) for integrating environmentally sound and sustainable development principles within a proposed development activity.

Box 3 Preparation of Environmental Overview of Programme (Project) and Management Strategy (EOP/MS) Annotated Outline for Tool 2 and Tool 4

Although the text of this EOP/MS refers to projects, it can also be used for programmes. This outline contains a 'menu' of possible topics that might assist staff members to develop EOPs. Thus the sections included here should be completed only when applicable (see also Annex III for a sample EOP and MS). Information can be presented sectorally rather then geographically if necessary. Linkages between sections should be identified

1 Brief Description of the EOP/MS Environment of the Area of the Project (1 page maximum)

In general, this section is intended to provide all those who are participating in the development of a UNDP Project with basic general information on the physical characteristics of the environment in the area. The idea is to highlight any important aspects of the natural environment that might be a determinant in the design, appraisal, extension, approval and assessment of a proposed UNDP regional, national or local project.

Land and water ecosystems

Describes those types of land and water ecosystems that characterize the project area (such as plains, valleys, mountain ecosystems, rivers, lakes) and whether any of these are known to represent untapped environmental opportunities or areas of particular environmental concern. Includes information on climate if appropriate, such as when the project relates to specific types of agricultural production. In urban areas, describes briefly the relevant geographical features.

Living resources

Describes (1) the biological species (fauna and flora) in the project area that represent particular concerns and/or opportunities for the environment (for example, the unexploited potential of certain resources such as medicines that could be obtained from tropical forest species), (2) the socio-cultural context in the project area (population size, ethnicity, poverty and gender indicators etc.).

2 Main Environmental Issues in the Project Area (1 page maximum)

This section covers the three environmental issues that are most important in the area where the project will be implemented—whether, for example, the area is prone to flooding, there is an ongoing process of desertification, or the sustainable fish catch potential is smaller than present exploitation. Topics to consider might include quality of life of the local population, natural hazards, fragile ecosystems, role of children and women and over-crowding. Consultations with local population groups will improve the accuracy of this section.

3 Economics and the Environment in the Project Area (1 page maximum)

This section generally discusses whether the prevailing economic situation in the project area will affect the environment. Lists any prevailing national or local economic policies and regulations in the project area that affect the quality of the environment. Any enforcement mechanisms that prevail in the project area to protect the local environment should also be included. General statements about the population's socio-economic situation may be added if not listed under 1 above.

4 Environmental Management in the Project Area (1 page maximum)

This section should describe the capacity of the people and institutions working in the project area to cope with their environmental problems, achieve appropriate environmental management and promote sustainable development.

Legal and regulatory

> Describes whether there are explicit environmental policies and regulations in the project area and, if so, whether they have the enforcement mechanisms and appropriate technical and financial support to be effective.

Major environmental actors

> Includes a brief description of the main environmental actors in the project area (government authorities, international organizations, private sector, NGOs, individuals) and their objectives and strategies. Identifies possible conflicts among the actors if the proposed project is implemented. Consider whether women play an active role in all these groups and are able to make the necessary contributions, explain their role.

Technical and managerial capacity to deal with environmental issues

> Describes generally the existing educational, technical and managerial capacity in the project area (within the public, private, NGO and academic sectors) to deal with the environmental issues relevant to the project. Special emphasis should be given to the presence and activities of grass-roots organizations working on environmental protection. The strength and resources of environmental institutions in the project area should be briefly assessed.

5 Major Natural and Socio-Economic Impacts and Opportunities Associated with the Project Implementation (1 page maximum)

Both these sections should incorporate the views of the affected population groups; participatory development techniques should therefore be used whenever possible.

Potential impacts on the natural environment

> Identifies the potential impacts, both positive and negative, that the implementation of the project may have upon the natural environment. Identifies the three most important environmental impacts that the implementation of the project might bring about, and describes how the project will address them. If the project is on agroforestry, for example, indicates whether soil conservation, watershed management and appropriate selection of pesticides and fertilizers have been envisaged.

Potential socio-economic impacts

> Lists the three most important potential benefits and costs to the socio-economic impacts environment that may result from the implementation of the project.

6 Alternatives for Project Design (1/2 page maximum)

This section will discuss the possibility of altering the project design (technology, project objectives and methodology of implementation) to take better advantage of the opportunities offered by the environment in the project area, and to mitigate and eliminate the environmental disadvantages that the project might create.

7 Identification of Environmental Objectives of the Proposed Activity (1/2 page)

The EOP/MS should state clearly and succinctly the environmental objectives of the alternative. These must conform with the broader development objectives of the country and therefore might go beyond the particular activity's goals. If a proposed activity does not explicitly indicate any environmental objectives, UNDP staff should request that such objectives be identified.

For example, a project on animal-husbandry might identify production targets but not explicitly include environmental objectives. If the proposed activity will introduce new technologies or exotic animal and plant varieties, relocate people or introduce new chemical products, the local environment will be affected. The strategy, in this case, will help identify and clearly design the environmental objectives of such an animal-husbandry project. Environmental objectives could include soil protection, plant conservation and integrated agricultural development.

8 Identification of Conflicts of Interest

Some of the objectives pursued by different environmental actors might conflict. For example, the interests of companies that commercialize chemical fertilizers will conflict with activities aiming to promote organic fertilization. The EOP/MS must identify such conflicts of interest and devise possible alternatives to avoid them. In the previous example, an incentive might be proposed for the commercial chemical enterprise to sell other fertilizers (including organic) that will promote soil fertility without damaging the environment.

9 Formulation of an Operational Strategy

The most important action-oriented part of the EOP/MS is the formulation of an operational strategy that will allow the achievement of the environmental objectives and goals proposed by the EOP/MS. The strategy must be formulated by the staff proposing, designing or evaluating the activity in consultation with project participants.

Specific environmental targets to be achieved

Identifies specific environmental targets in addition to the main environmental policy objectives identified in Section 2. If the proposed activity entails manufacturing processes (such as tanneries or food processing) which generate waste, for example, specific environmental targets would be set such as reducing all waste emissions by 15% over a period of three years and installing interim measures.

Participants in environmental management

Identifies the objectives and strategies of the major actors related to the environment in the area where the proposed activity will take place.

Plan of activities and timetable

Identifies a number of activities that will lead to the implementation of the strategy. A timetable must also be formulated indicating when such activities are expected to occur, and who will be responsible for them. As the EOP/MS will eventually become part of either the programme or project document, the proposed environmental activities and timetable should be compatible with the overall activities and timetable of the Programme or Project. Relevant national and local activities and timetables should also be considered.

Environmental information

Provides reliable and accurate environmental information as the basis for sustainable decision making, while acknowledging that accurate environmental information is difficult to obtain, especially in developing countries. The EOP/MS might include efforts to obtain the most accurate environmental information relevant to the proposed activity or to initiate work that will generate the necessary information over an identified period.

Supporting needs

Identifies the specific needs required for the successful implementation of the strategy. The needs to be identified include:

- Education and training
- Technical and managerial skills
- Access to environmental data banks

- Institutional support
- Financial aspect

The development and implementation of the EOP/MS requires technical and financial resources. Technical assistance might be needed from UNDP in order to develop the strategy and identify the resources required to carry it out.

Assigning implementation responsibilities

States clearly who will be accountable for implementing each one of the activities proposed within the strategy.

Decision making

Analyzes the environmental chain of command and responsibilities in the area where an activity is being considered. This analysis should not be restricted to the chain of command in the environmental field (ministry of the environment, forestry sector) but should include the other sectors of the economy that are intimately related to the environment such as industry, trade, health, and so on. The objective is to identify to whom suggestions and recommendations—indeed, the entire EOP/MS—would be addressed. It should also include what would be the most efficient way to influence the decision-making process to protect and enhance the environment.

10 Monitoring the EOP/MS

Every UNDP-sponsored activity is monitored regularly to ensure that its stated objectives are being achieved in the time framework envisaged. As the EOP/MS will probably be incorporated into the programme or project document that describes the proposed activity, it should be monitored according to the procedures presented. Constant, cautious monitoring on an as frequent a basis as possible, using specific success indicators for the points raised in the strategy, will help guarantee that the objectives are achieved.

The main difference between an EO and an EMS is that the latter is an ongoing effort demanding close UNDP monitoring throughout the activity while the former is a more static undertaking completed during project formulation. The EMS should be prepared by those proposing the implementation of a project: mainly government officials, NGOs, academic institutions and UN agencies responsible for implementation. Terms of reference will need to refer to the EMS preparation.

The EMS, as part of the EOP/MS, steps 7 to 10, will be prepared according to the specifications provided in Box 3, using participatory development techniques to the greatest extent possible. The length of an EMS can vary greatly, so guidelines on the length of each section are not included. UNDP staff are responsible for ensuring that the EMS is prepared according to these guidelines. It is recommended that the proposed project executer undertake the technical coordinating responsibilities, using, as necessary, appropriate UN agencies and/or other affiliated agencies or NGOs.

The ideas expressed in the EMS eventually need to be incorporated into the objectives, activities, inputs, work plan and so on of the project or programme document. Special references should also be made to the EMS and, if necessary, a specific section summarizing the EMS should be added. The EMS should also be attached as an annex to these documents to assist in monitoring the activities over time.

BOX 4 Criteria for Screening UNDP EOCs and EOPs Tool 3

It is recommended that the programmes/projects that fall within any of the following categories be subject to further environmental consideration:

Environmentally Sensitive Areas or Activities

- Activities leading to encroachments on tropical rain forests, wetlands, mangrove forests, coral reefs, coastal zones or other vulnerable areas
- Activities changing natural vegetation and/or the habitats of wildlife species, or in areas inhabited by endangered species
- Activities in legally declared protected areas

Environmental Overview (initial environmental evaluation)

- Ecologically fragile areas (including those identified as such by NGOs)
- Areas subject to desertification, arid and semi-arid zones, drylands
- Ecotourism activities
- Areas of unique conservation, historical, cultural, archaeological or aesthetic interest
- Areas of particular social significance (habitats for nomadic people or indigenous populations)
- Areas where pre-established pollution limits have been exceeded or where activities would lead to air, water, soil, radioactive or noise pollution

Livestock, Farming and Fishing Practices

- Sustainable agriculture
- Activities leading to soil erosion or in soil-conservation areas
- Integrated pest control or pesticide use/management
- Agroforestry
- Afforestation
- Activities leading to increased grazing
- Introduction or modifications of new crops or livestock
- Introduction of new species where there is limited knowledge of the ecological functions of the local ecosystem
- Biotechnology
- Activities with the possibility of exceeding carrying capacity (eg. catching larger quantities of fish than can be replaced by natural rate of growth)
- Controlled breeding and exploitation of fish or shellfish carried out in marine or inland waters or in artificial ponds

Activities Dealing with Water Resources

- Water management
- Irrigation and flood control
- Hydroelectric
- Ground water
- Management of inland wetland ecosystems
- Health and sanitation

Infrastructure and Industrial Strengthening

- Large infrastructure and urbanization activities (eg. port development, airports and railway systems)
- Energy generation
- Mining (land and water)
- Activities leading to conflicts over use of resources (eg. port development and tourism)
- All industrial development
- Activities causing emissions to soil, water and air and/or that may endanger the environment
- Activities demanding considerable increases in consumption of raw materials (water, land, fossil fuels)
- Activities creating major changes in landscape
- Activities creating risks of accidents that could have serious consequences for local people or the natural environment
- Occupational safety and training
- Activities that introduce immigrant labour and change local social fabric

Urbanisation, Land Development and Waste Management

- Human settlements (housing, office, commercial buildings)
- Land-use planning or road building
- Activities leading to accumulation of waste and creation of unwanted disposal sites
- Production, transport or storage of hazardous wastes.
- UNDP Environmental Overview
- ADB Checklist of Environmental Parameters for Major Dam/:Reservoir/Hydropower Projects

Project Screening Lists

Screening List A: Projects requiring no Environmental Analysis

DG VII Sectoral Classification	
SOCIAL INFRASTRUCTURE AND SERVICES	
Education	• Educational facilities (small-scale) • Teaching facilities and equipment • Scholarships and conferences • Teaching staff and resource personnel • Audio-visual productions • Training
Health	• Medical centres (small-scale) • Medical supplies and equipment • Medical staff and community health workers • Training • Nutrition
Population	• Family planning
ECONOMIC INFRASTRUCTURE AND SERVICES	• Telecommunications • Research
PRODUCTION SBECTOR	• Trade (except trade in tropical hardwoods, endangered species, hazardous materials)
MULTI SECTOR	• Micro-projects/programmes (small-scale capital and service)
FINANCIAL ASSISTANCE	• Programme assistance (general and sectoral import programmes) • Non-project/special country support (stabex)
FOOD AID	• Food aid
EMERGENCY OPERATIONS	• Emergency assistance • Assistance to refugee returnees and displaced persons
AID THROUGH PRIVATE ORGANISATIONS	(REFER TO APPROPRIATE SECTOR)
TECHNICAL ASSISTANCE	• Studies, including evaluations • Technical assistance for project implementation • Technical assistance for policy formulation • Works supervision • Institution building at the government/local level

* Under certain local circumstances, the Delegation can over-ride this categorisation and place the project in Category B, for instance in cases of substantial amounts of food aid.

Source: Commission of the European Communities (1993)

Screening List B: Projects requiring further Environmental Analysis

DG VIII Sectoral Classifications

SOCIAL INFRASTRUCTURE AND SERVICES	
1. Rural and Urban Water Supply and Sanitation	• Rural water supply and sanitation • Land drainage (small scale) • Sewerage systems • Installations for the disposal of sewerage sludge
2. Waste Disposal	• Recycling plants • Installations for the disposal of domestic refuse (large scale)
3. Urban Development	• Housing and commercial projects
ECONOMIC INFRASTRUCTURE AND SERVICES	
4. Transport	• Upgrading/rehabilitation of major rural roads • Airports with basic runway length less than 2,100m
5. Ports and Harbours	• Inland ports which permit the passage of vessels under 1350 tonnes • Upgrading of port or harbour facilities (large scale)
6. Energy	• Thermal power stations and other combustion installations with a heat output of less than 300 megawatts • Electricity transmission lines • Rural electrification • Renewable energy (large scale) • Mini-Hydro
PRODUCTION SECTOR	
7. Agriculture	• Widespread introduction of new management practices (eg. mechanisation, mixed cropping) • Widespread introduction of new crops • Pest control programmes (large scale) • Widespread introduction of fertilisers • Watershed management and rehabilitation
8. Irrigation	• Surface-water fed irrigation projects covering between 100 and 500 hectares • Ground-water fed irrigation projects covering between 200 and 1000 hectares
9. Forestry	• Protected forest reserves (large-scale) • Agro-forestry (large-scale) • Productive forest reserves (large-scale)
10. Livestock	• Intensive rearing of cattle (>50 heads), pigs (>100 heads), or poultry (>500 heads)

Screening List B: Projects requiring further Environmental Analysis (cont)

11. Fisheries and Aquaculture	• Intensive aquaculture (large-scale) • Extensive aquaculture (exceeding 50ha, or exceeding 10ha if affecting mangroves) • Artisanal fisheries (large-scale) • Introduction of new species • Introduction of new harvesting technology
12. Mineral Extraction and Processing	• Extraction of aggregate minerals such as marble, sand, gravel, shale, salt, phosphates and potash • Extraction of non-metallic or energy producing minerals (small-scale)
13. Industry	• Agro-industries, including manufacture of vegetable and animal oils and fats; manufacture, packing and canning of animal, fish and vegetable products • Manufacture of timber products, pulp, paper and board (large-scale) • Tannery and leather-dressing factories • Production of chemicals, including pesticides (small-scale) • Industries utilising hazardous materials (small-scale)
14. Tourism	• Accommodation (large-scale) • Amenities (large-scale), such as water, energy, sanitation, waste disposal • Facilities (large-scale), such as beach use, marinas, modifications to ports, entertainment complexes • Ecological or cultural-tourism (dependent upon conservation-worthy ecosystems, flora or fauna; or local populations with a particular cultural identity)
15. Resettlement	• All other resettlement schemes

Source: Commission of the European Communities (1993)

Screening List C: Projects requiring a full Environmental Impact Assessment

DG VIII Sectoral Classifications

SOCIAL INFRASTRUCTURE AND SERVICES	
1. Rural and Urban Water Supply and Sanitation	• Canalisation and flood-relief works (large-scale) • Dams and reservoirs (medium and large-scale) • Wastewater treatment plants (large-scale) • Land drainage (large-scale)
2. Waste Disposal	• Waste disposal installations for the incineration, chemical treatment or land fill of toxic, hazardous and dangerous wastes • Installations for the disposal in industrial wastes
3. Urban Development	• Hospital and educational facilities (large-scale)
ECONOMIC INFRASTRUCTURE AND SERVICES	
4. Transport	• Major urban roads • New and upgraded motorways/express roads • Rural road programmes • Oil and gas pipelines and installations • Rail infrastructure • Elevated and underground railways and suspended lines used mainly for passenger transport • Inland waterways • Airports with a basic runway length of 2,100m or more
5. Ports and Harbours	• Trading ports • Ports for inland waterways traffic which permit the passage of vessels over 1350 tonnes • Large scale expansions to existing ports and harbours
6. Energy	• Thermal power stations and other combustion installations with a heat output of 300 megawatts or more • Hydroelectric power (large-scale)
PRODUCTION SECTOR	
7. Agriculture	• Land clearing/conversion to agriculture (large-scale) • Land reclamation (large-scale)
8. Irrigation	• Surface-water fed irrigation projects covering more than 500 hectares • Ground-water fed irrigation projects more than 1000 hectares
9. Forestry	• Plantation afforestation/reforestation (large-scale)
10. Livestock	• Large-scale open range rearing of cattle, horses, sheep etc

Screening List C: Projects requiring a full Environmental Impact Assessment

11. Fisheries and Aquaculture	• Industrial Fisheries
12. Mineral Extraction and Processing	• Deep drilling, such as geothermal, oil, and water supplies • Extraction of metallic and energy-producing minerals by open-cast mining • Extraction of coal/lignite by underground or open-cast mining • Surface industrial installations for the extraction of coal, petroleum, natural gas and ores • On-site mineral processing facilities (large-scale)
13. Industry	• Industrial estates • Major industrial facilities including the following: - Oil refineries - Gasification or liquefaction plants of 500 tonnes or more of coal or bituminous shale per day - Installations for the production of ferrous and non-ferrous metals, including smelting, refining, drawing, rolling and surface treatment (large-scale) - Installations for the extraction and processing of asbestos and cement products - Treatment and production of chemicals (large-scale), including integrated chemical installations - Manufacture or transport of pesticides or other hazardous and/or toxic materials
14. Tourism	• Coastal development (large-scale)
15. Resettlement	• Resettlement schemes (large-scale)

Source: Commission of the European Communities (1993)

IMPACT SIGNIFICANCE DETERMINATION - BASIC CONSIDERATIONS AND A SEQUENCED APPROACH

L.W. Canter and G.A. Canty

Environmental Impact Assessment Review, (1993): 13(5), pp275-297.

ABSTRACT

Determination of the significance of anticipated impacts of proposed projects is a key component in the overall environmental impact assessment (EIA) process. Definitions of significance and/or significant impacts are now included in the EIA guidelines or regulations of many countries and international organizations. Where possible in an EIA study, it is desirable to identify and/or establish the significance determination criteria prior to actual study conduction. This paper summarizes some findings of a survey of such definitions resulting from American, European, and other international experiences; both generic definitions and substantive area definitions are highlighted. Traditional perspectives on significance determination have involved institutional (or governmental or regulatory), technical (or professional substantive area), and public interest considerations. A sequenced approach for impact significance determination is described, with this approach organized around ten groups of issues or questions. Examples of such issues include project type/size, project locations in areas with protected or critical resources, and environmental stresses resulting from waste residuals from the project. Examples of significance criteria pertinent to the issues are presented through the paper. Finally, the uses of significance criteria can be noted; included in such uses are: (1) determining if an environmental impact statement (EIS) will be required, or if an environmental assessment/finding of no significant impact (EA/FONSI) will suffice; (2) identifying the impacts that should be mitigated; (3) planning a baseline and/or post-EIS environmental monitoring program; and (4) documenting the interpretive rationale used in the conduction of the environmental impact study.

INTRODUCTION

The National Environmental Policy Act (NEPA) in the United States requires that an environmental impact statement (EIS) be prepared on federal actions that have the potential for significantly affecting the quality of the human environment. The key issue is to determine "what is a significant impact?" If significant impacts, either detrimental or beneficial, are expected to occur, both monetary resources and time will be necessary in preparing an EIS. If the impacts are not significant, as determined via the preparation of an environmental assessment (EA), then a finding of no significant impact (FONSI) can be prepared with considerable savings in money and time.

The issue of significant effects and the resulting need to prepare an EIS is often the focal point of NEPA-related legal actions in the United States. For example, Moore (1992) noted that there were 80 actions brought in the Federal Courts in 1989; 34 were brought because no EIS had been prepared when it was contended that one should have been prepared. The issue was whether there were significant impacts. Since 1974, in every year except two, the issue of significant impacts has been the leading cause of litigation. There were 2,346 NEPA cases filed between 1970 and 1990, with over half of them raising the issue of significant impacts.

This paper begins with the significance definition and determination process as used in the United States. Examples of the uses of screening for significance determination are then included; screening can encompass policy delineations and the conduction of preliminary studies. This is followed by a brief review of definitions and selected processes from several countries and/or governmental institutions. A suggested sequenced approach for determining the significance of one or more impacts is then included. The final section relates to the uses of significance determinations in EA/FONSI/EIS preparation and the planning of mitigation and monitoring programs.

ILLUSTRATION OF SIGNIFICANCE DEFINITION - USA

The Council on Environmental Quality regulations issued in 1979 included a definition of significance (Council on Environmental Quality (CEQ) 1987). A key feature of the CEQ regulations is the concept of three levels of analysis; level 1 relates to a categorical exclusion determination, level 2 to the preparation of an environmental assessment and finding of no significant impact, and level 3 to the preparation of an environmental impact statement (U.S. Environmental Protection Agency 1989). Figure 1 depicts the interrelationships among these three levels. Key definitions from the CEQ regulations related to Figure 1 are addressed in the following paragraphs (Council on Environmental Quality 1987).

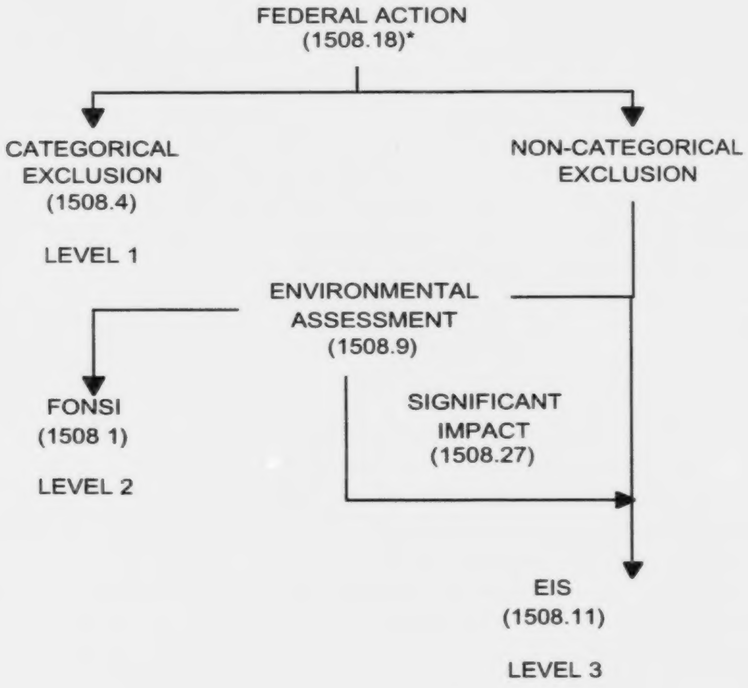


Figure 1. Three levels of analysis in the EIA process. *Number denotes paragraph in CEQ regulations that contains definition (Council on Environmental Quality 1987).

Federal actions subject to the requirements of NEPA include adoption of treaties and international conventions or agreements; formal documents establishing an agency's policies that will result in or substantially alter agency programs; formal plans, such as official documents prepared or approved by federal agencies that guide or prescribe alternative uses of federal resources, and upon which future agency actions will be based; and adoption of programs, such as a group of concerted actions to implement a specific policy or plan; or systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive. In addition, federal actions include approval of specific projects, such as construction or management activities located in a defined geographic area. Projects also include actions approved by permit or other regulatory decision as well as federal and federally assisted activities.

A categorical exclusion refers to a category of actions that do not individually or cumulatively have a significant effect on the human environment, and that have been found to have no such effect in procedures adopted by a federal agency in implementation of the CEQ regulations and for which, therefore, neither an EA nor an EIS is required.

An EA is a concise public document for which a federal agency is responsible that serves to briefly provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI; aid an agency's compliance with the NEPA when no EIS is necessary; or facilitate preparation of an EIS when one is necessary. A FONSI is a document by a federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the human environment and for which an EIS therefore will not be prepared. It shall include the EA or a summary of it and shall note any other environmental documents related to it. The FONSI was initially referred to as a negative declaration.

The definition of significantly or significant impact is the key in the EIA process because a proposed action that significantly affects the human environment requires an EIS. "Significantly" as used in NEPA requires considerations of both context and intensity; and Table I delineates these considerations (Council on Environmental Quality 1987).

Finally, the EIS is a detailed written statement as required by Section 102(2)(C) of NEPA. The primary purpose of an EIS is to serve as an action-forcing device to ensure that the policies and goals defined in NEPA are infused into the ongoing programs and actions of the federal government. It shall provide full and fair discussion of significant environmental impacts and shall inform decision makers and the public of the reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. The EIS shall be used by federal officials in conjunction with other relevant material to plan actions and make decisions.

As shown in Figure 1, and based on the definitions above, all federal actions can be divided into either categorical exclusions or noncategorical exclusions. Each federal agency has published their list of categorical exclusions following appropriate consultation with CEQ. For federal actions that are noncategorical exclusions, it may be necessary to do an environment assessment (EA) in order to determine whether or not an EIS will be required. Again, agencies have published lists of their typical actions that normally require an EA but not necessarily an EIS; one example is in U.S. Army Corps of Engineers (1988).

The key issue in Figure 1 is related to whether or not the federal action is a "major action significantly affecting the quality of the human environment" (MASAQHE). This phrase is in Section 102 of NEPA. Defining a MASAQHE involves both quantitative and qualitative considerations. The simplest way of defining a major action is to compare a predicted impact with an environmental quality standard for a given parameter. It is possible to do this for many substances found in air and water, for example, carbon monoxide in the atmosphere and dissolved oxygen in water. However, there are many environmental parameters for which only descriptive standards are available, such as scenic vistas and archaeological sites. Agencies may define MASAQHE by project type, indicating that certain projects require impact statements because they are major actions, and others do not because they are minor actions. The definition of "significantly" in Table 1 refers to both context and intensity. Context is primarily related to the "when and where" of the impacts. The ten points listed for intensity can be divided into two groups as follows: (1) those related to environmental laws, regulations, policies, and executive orders (points 2, 3, 8, 9 and 10 in the list); and (2) those related to other considerations and how they in turn may have implications for environmental laws, regulations, policies, and executive orders (points l, 4, 5, 6, and 7 in the list).

Table 1 Context and Intensity Considerations in Defining "Significantly" as Used in the NEPA Process in the USA (Council on Environmental Quality 1987)

(a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the local area rather than in the world as a whole. Both short- and long-term effects are relevant.

(b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity.

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial.
2. The degree to which the proposed action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

An excellent series of review questions for assessing significance has been developed by the U.S. Army Corps of Engineers (1983). Additional factors to consider in characterizing impacts from proposed programs/plans/projects include whether the impacts are: (1) beneficial or detrimental; (2) naturally reversible or irreversible; (3) repairable via management practices or irreparable; (4) short-term or long-term; (5) temporary or continuous; (6) expected for the construction or operational phase; (7) local, regional, national, or global; (8) accidental or planned (recognized beforehand); (9) direct or primary, or indirect or secondary; and (10) cumulative or single.

In addition, one of the things that can be done in conjunction with identified significant negative impacts is to consider appropriate mitigation measures that could be applied to reduce negative impacts within reasonable environmental and economic constraints. Again relative to the United States practice, the definition of mitigation includes (Council on Environmental Quality 1987): avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitation, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and/or compensating for the impact by replacing or providing substitute resources or environments. The concept in terms of mitigation would be that if potentially significant negative impacts are identified, and if they can be reduced via mitigation to something of lesser concern, then it would be possible to do an EA without going to a comprehensive study leading to an EIS. This would lead to a "mitigated FONSI." However, it should be noted that this is possible only if the mitigation requirements are carefully delineated so as to ensure that the pertinent measures which have been identified are implemented. This is most easily accomplished for actions approved by permit. Therefore, based upon the above definitions and process, it might be desirable to consider three levels of significance: (1) significant and not mitigable; (2) significant but mitigable; and (3) insignificant.

SCREENING FOR SIGNIFICANCE DETERMINATION

Screening and scoping are terms that have been developed for usage in the environmental impact assessment (EIA) process being implemented in numerous countries. There are both subtle and significant differences between the usage of these terms from country to country. In effect, these terms are really related to the concept of impact significance determination described earlier. Figure 2 illustrates the conceptual relationship between screening and scoping. Fundamentally, if a proponent is developing a specific program, plan, or project, then the basic issue initially is the potential applicability of EIA requirements. Screening basically addresses the issue of whether or not an environmental impact study would be required for the potential program, plan, or project. In many countries the resultant report on the environmental impacts is called an environmental impact assessment (EIA) or an environmental assessment (EA); as noted earlier, in the United States the resultant report is called an environmental impact statement (EIS). Therefore, the fundamental issue addressed via screening is whether or not a comprehensive environmental impact study should be conducted. Scoping is typically introduced after a decision is made on the need for a comprehensive environmental impact study, although it could be used as a component of screening considerations. Scoping is primarily focused on determining the specific issues/impacts that may need to be addressed in a comprehensive environmental impact study.

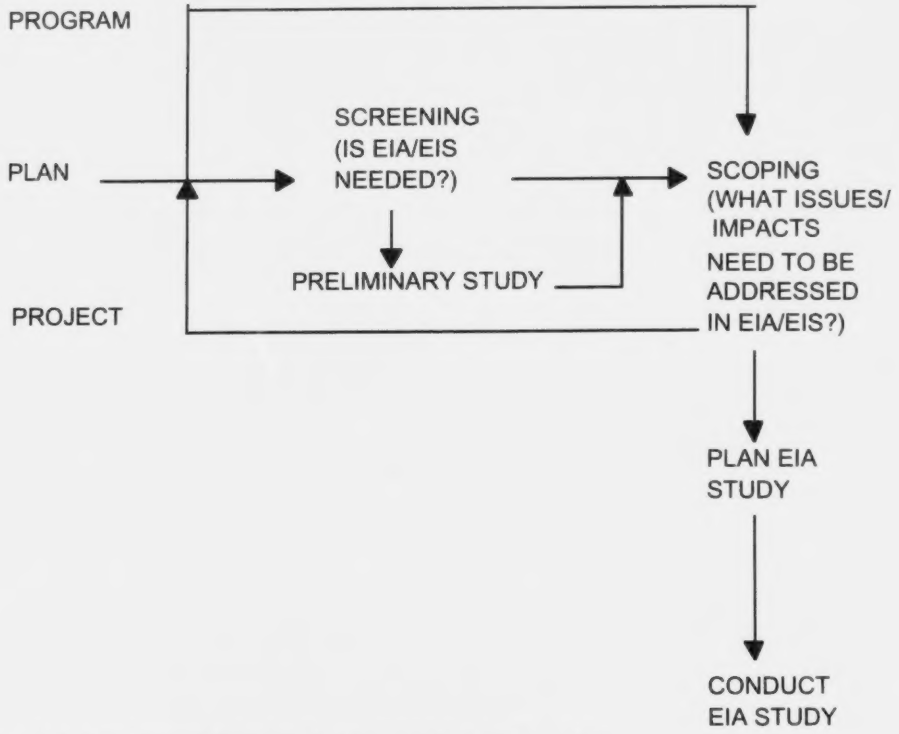

PROGRAM
PLAN
PROJECT
SCREENING (IS EIA/EIS NEEDED?)
PRELIMINARY STUDY
SCOPING (WHAT ISSUES/ IMPACTS NEED TO BE ADDRESSED IN EIA/EIS?)
PLAN EIA STUDY
CONDUCT EIA STUDY

Figure 2. Conceptual framework for screening and scoping.

It would be possible to directly determine the need for a comprehensive environmental impact study, and then to address the scope of the issues/impacts that are relevant. Conversely, it may be necessary to conduct a preliminary study as a part of determining whether or not a comprehensive environmental impact study would be necessary. A confusing point is that this "preliminary study" is referred to by different terms in different countries. For example, in the United States the term environmental assessment (EA) is used, whereas in Canada and other countries the term initial environmental evaluation (IEE) finds application. Two fundamental approaches for determining whether or not to prepare a comprehensive environmental impact study for a proposed program/plan/project include the use of policy delineations based on project type or size, or the conduction of a preliminary study.

Table 2. Categorization of Projects as Used by the European Communities (European Communities 1985)

Annex 1: Projects Requiring Environmental Impact Assessments

1. Crude-oil refineries (excluding undertakings manufacturing only lubricants from crude oil) and installations for the gasification and liquefaction of 500 tons or more of coal or bituminous shale per day.
2. Thermal power stations and other combustion installations with a heat output of 300 megawatts or more and nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load).
3. Installations solely designed for the permanent storage or final disposal of radioactive waste.
4. Integrated works for the initial melting of cast-iron and steel.

5. Installations for the extraction of asbestos and for the processing and transformation of asbestos and products containing asbestos: for asbestos-cement products, with an annual production of more than 20,000 tons of finished products, for friction material, with an annual production of more than 50 tons of finished products, and for other uses of asbestos, utilization of more than 200 tons per year.
6. Integrated chemical installations.
7. Construction of motorways, express roads, and lines for long-distance railway traffic and of airports with a basic runway length of 2,100 m or more.
8. Trading ports and also inland waterways and ports for inland-waterway traffic that permit the passage of vessels of over 1,350 tons.
9. Waste-disposal installations for the incineration, chemical treatment, or land fill of toxic and dangerous wastes.

Annex II: Projects that May Be Subject to an EIA

1. Agriculture
   - (a) Projects for the restructuring of rural land holdings.
   - (b) Projects for the use of uncultivated land or semi-natural areas for intensive agricultural purposes.
   - (c) Water-management projects for agriculture.
   - (d) Initial afforestation where this may lead to adverse ecological changes and land reclamation for the purposes of conversion to another type of land use.
   - (e) Poultry-rearing installations.
   - (f) Pig-rearing installations.
   - (g) Salmon breeding.
   - (h) Reclamation of land from the sea.
2. Extractive industry
   - (a) Extraction of peat.
   - (b) Deep drillings with the exception of drillings for investigating the stability of the soil and in particular:
     - geothermal drilling,
     - drilling for the storage of nuclear waste material,
     - drilling for water supplies.
   - (c) Extraction of minerals other than metalliferrous and energy-producing minerals, such as marble, sand, gravel, shale, salt, phosphates and potash.
   - (d) Extraction of coal and lignite by underground mining.
   - (e) Extraction of coal and lignite by open-cast mining.
   - (f) Extraction of petroleum.
   - (g) Extraction of natural gas.
   - (h) Extraction of ores.
   - (i) Extraction of bituminous shale.
   - (j) Extraction of minerals other than metalliferrous and energy-producing minerals by open-cast mining.
   - (k) Surface industrial installations for the extraction of coal, petroleum, natural gas and ores, as well as bituminous shale.
   - (l) Coke ovens (dry coal distillation).
   - (m) Installations for the manufacture of cement.
3. Energy industry

- (a) Industrial installations for the production of electricity, steam, and hot water (unless included in Annex I).
- (b) Industrial installations for carrying gas, steam, and hot water; transmission of electrical energy by overhead cables.
- (c) Surface storage of natural gas.
- (d) Underground storage of combustible gases.
- (e) Surface storage of fossil fuels.
- (f) Industrial briquetting of coal and lignite.
- (g) Installations for the production or enrichment of nuclear fuels.
- (h) Installations for the reprocessing of irradiated nuclear fuels.
- (i) Installations for the collection and processing of radioactive waste (unless included in Annex I).
- (j) Installations for hydroelectric energy production.

4. Processing of metals
    - (a) Iron and steelworks, including foundries, forges, drawing plants and rolling mills (unless included in Annex 1).
    - (b) Installations for the production, including smelting, refining, drawing and rolling, of nonferrous metals, including precious metals.
    - (c) Pressing, drawing and stamping of large castings.
    - (d) Surface treatment and coating of metals.
    - (e) Boilermaking, manufacture of reservoirs, tanks and other sheet-metal containers.
    - (f) Manufacture and assembly of motor vehicles and manufacture of motor-vehicle engines.
    - (g) Shipyards.
    - (h) Installations for the construction and repair of aircraft.
    - (i) Manufacture of railway equipment.
    - (j) Swaging by explosives.
    - (k) Installations for the roasting and sintering of metallic ores.
5. Manufacture of glass
6. Chemical industry
    - (a) Treatment of intermediate products and production of chemicals (unless included in Annex I).
    - (b) Production of pesticides and pharmaceutical products, paint and varnishes, elastomers and peroxides.
    - (c) Storage facilities for petroleum, petrochemical, and chemical products.
7. Food industry
    - (a) Manufacture of vegetable and animal oils and fats.
    - (b) Packing and canning of animal and vegetable products.
    - (c) Manufacture of dairy products.
    - (d) Brewing and malting.
    - (e) Confectionery and syrup manufacture.
    - (f) Installations for the slaughter of animals.
    - (g) Industrial starch manufacturing installations.
    - (h) Fish-meal and fish-oil factories.
    - (i) Sugar factories.
8. Textile, leather, wood, and paper industries

- (a) Wool scouring, degreasing, and bleaching factories.
- (b) Manufacture of fiber board, particle board, and plywood.
- (c) Manufacture of pulp, paper, and board.
- (d) Fiber-dyeing factories.
- (e) Cellulose-processing and production installations.
- (f) Tannery and leather-dressing factories.

9. Rubber industry-Manufacture and treatment of elastomer-based products.
10. Infrastructure projects
    - (a) Industrial-estate development projects.
    - (b) Urban-development projects.
    - (c) Ski-lifts and cable-cars.
    - (d) Construction of roads, harbors, including fishing harbors, and airfields (projects not listed in Annex I).
    - (e) Canalization and flood-relief works.
    - (f) Dams and other installations designed to hold water or store it on a long-term basis.
    - (g) Tramways, elevated, and underground railways, suspended lines or similar lines of a particular type, used exclusively or mainly for passenger transport.
    - (h) Oil and gas pipeline installations.
    - (i) Installation of long-distance aqueducts.
    - (j) Yacht marinas.
11. Other projects
    - (a) Holiday villages, hotel complexes.
    - (b) Permanent racing and test tracks for cars and motorcycles.
    - (c) Installations for the disposal of industrial and domestic waste(unless included in Annex I).
    - (d) Waste-water treatment plants.
    - (e) Sludge-deposition sites.
    - (f) Storage of scrap iron.
    - (g) Test benches for engines, turbines, or reactors.
    - (h) Manufacture of artificial mineral fibers.
    - (i) Manufacture, packing, loading, or placing in cartridges of gunpowder and explosives.
    - (j) Knackers' yards.
12. Modifications to development projects included in Annex I and projects in Annex I undertaken exclusively or mainly for the development and testing of new methods or products and not used for more than one year.

SCREENING VIA POLICY DELINEATIONS

An example of a policy basis for screening is the European Community Directive on EIA; this directive has categorized projects depending upon their needs for comprehensive environmental impact studies. Table 2 contains a list of these projects in accordance with project type and size (European Communities 1985). To serve as an example of the member states of the European Community developing further guidance for projects listed in Annex II of Table 2, the United Kingdom has indicated that the need for preparation of an EIA is "unlikely" for the following projects: thermal power stations below 50 MWTh; hydroelectric power stations below 10 MW; windfarms below 1 MW; combined heat and power installations below 50 MWTh; transmission lines below 132 KV; and overhead lines less than 1 km in length. Another example of a policy-based screening approach is that utilized by the

World Bank in their guidance on the conduction of environmental assessments (World Bank 1989). Specifically, four categories of projects are delineated: those which would normally require an environmental impact study (Category A), those which may need some limited environmental review (Category B), those which normally do not need an environmental analysis (Category C), and environmentally beneficial projects and emergency recovery projects (Category D). As noted earlier, in the United States the approach has been to delineate categorical exclusions from the EIA process.

SCREENING VIA A PRELIMINARY STUDY

The second fundamental approach for screening is to conduct a preliminary study and, pending the findings of the study, either proceed to a comprehensive environmental impact study or document that the findings of the preliminary study were such that a comprehensive impact study would not be required. As noted earlier, the key is to determine if significant impacts are expected. Three examples from the United States and Canada will be used to illustrate this approach. The examples typically involve review questions and/or criteria.

Three considerations have been delineated for water resources projects in the United States. Specifically, Principles and Guidelines (1983) defined significance for environmental quality (EQ) resources based on institutional, public, and/or technical recognition. The relevant definitions are included in Table 3 (Principles and Guidelines 1983). The concept is that if one or more of these recognition bases indicate that an EQ resource or attribute is significant, then the impacts on such would also be considered as significant.

Another example involving the conduction of preliminary studies is the procedure developed and utilized in Canada. Figure 3 illustrates the role of screening and initial environmental evaluations in conjunction with the evaluation of a project (Federal Environmental Assessment Review Office 1985). The concept of screening can lead to some proposals being automatically excluded and some being automatically referred. Screening permits the proponent to arrive at one or more of the following conclusions relative to the potential impacts of the proposal: (1) there are insignificant adverse effects; (2) there are significant adverse effects that are mitigable; (3) there are significant adverse effects that may or may not be mitigable; (4) uncertainty exists relative to the environmental effects; (5) the effects are unknown; or (6) significant adverse effects are anticipated, and/or significant public concern exists, thus an environmental impact study should be conducted.

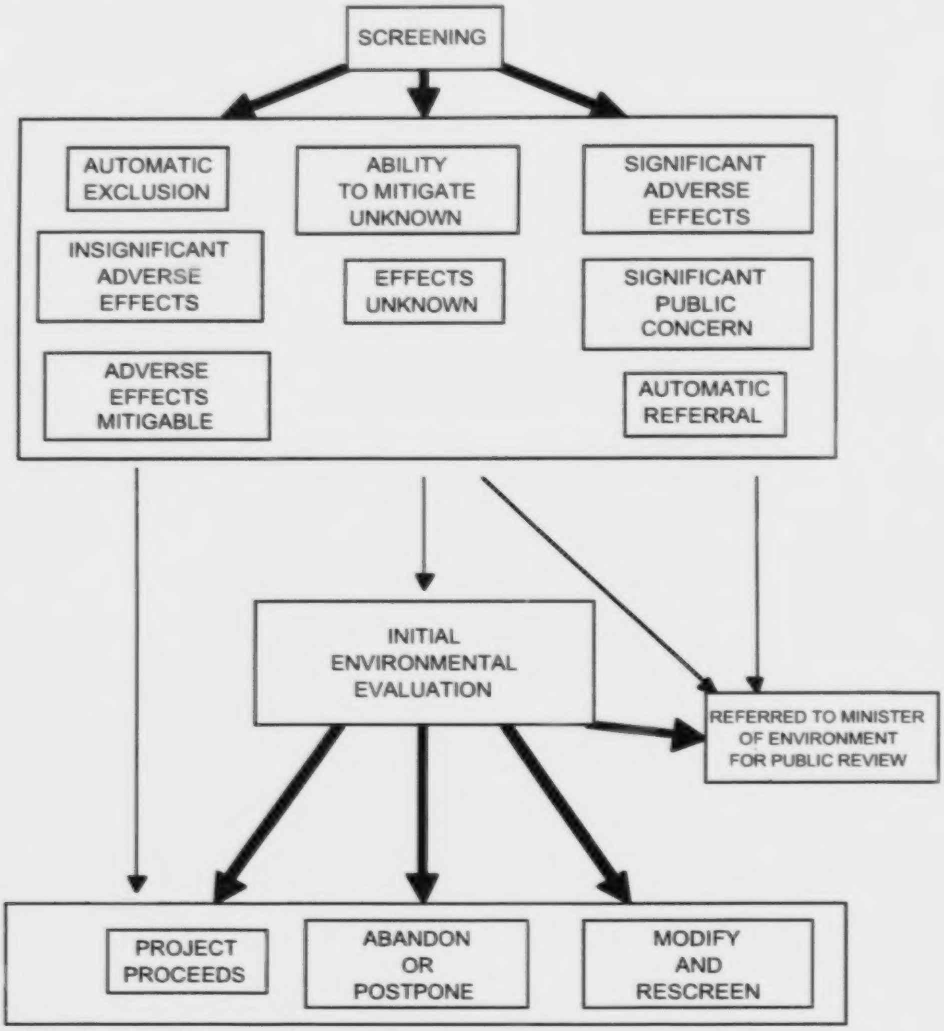
Based only on Figure 3, it is not immediately obvious as to the basis for reviewing the findings of the initial environmental evaluation and determining if a comprehensive environmental impact study should be conducted. In accordance with the procedures in Canada, the central consideration is also associated with determining the significance of the anticipated impacts. In the approach used, basic questions are asked to determine the significance of ecosystem components and the associated significance of anticipated impacts. Table 4 delineates a sequence of questions that can be used to determine the significance of the resource and anticipated impacts, with the basic presumption for those projects with resources or impacts that are deemed to be significant, an environmental impact study would be required (Federal Environmental Assessment Review Office 1985). Valued ecosystem components must be determined before significant impacts can be discussed. This requires evaluation of the political, legal, public, and professional significance of environmental components. Determination of significant impact also relates to the degree of change in valued ecosystem components measured against some standard or threshold.

Table 3 Impact Significance Considerations for Water Resources Projects in the United States (Principles and Guidelines 1983)

1. Significance based on institutional recognition means that the importance of an EQ resource or attribute is acknowledged in the laws, adopted plans, and other policy statements of public agencies or private groups. Sources of institutional recognition include:
    - (a) Public laws, executive orders, rules and regulations, treaties, and other policy statements of the federal government.
    - (b) Plans and constitutions, laws, directives, resolutions, gubernatorial directives, and other policy statements of states with jurisdiction in the planning area. Examples are state water and air quality regulations; state historic preservation plans; state lists of rare, threatened, or endangered species; and state comprehensive fish and wildlife management plans.
    - (c) Laws, plans, codes, ordinances, and other policy statements of regional and local public entities with jurisdiction in the planning area. Regional entities include river basin commissions, councils of government, and regional planning boards. Local entities include counties, districts, parishes, cities, towns, and villages. Examples of these entities' sources of institutional recognition are regional open space plans, county lists of historic sites, and town zoning ordinances.
    - (d) Charters, bylaws, and formal policy statements of private groups. Examples are the National Audubon Society Blue List of Species, properties of the National Trust for Historic Preservation, and properties of the Nature Conservancy.
2. Significance based on public recognition means that some segment of the general public recognizes the importance of an EQ resource or attribute. Public recognition may take the form of controversy, support, conflict, or opposition and may be expressed formally (as in official letters) or informally. Environmentally related customs and traditions should also be considered. EQ resources or attributes recognized by the public will often change over time as public awareness and perceptions change.
3. Significance based on technical recognition means that the importance of an EQ resource or attribute is based on scientific or technical knowledge or judgement of critical resource characteristics. Examples are a graveyard recognized by an archaeologist as being the focal point of a 19th century community; a rock outcropping identified by a landscape architect as being an important scenic element based on aesthetic-rating criteria; and a meadow identified by a wildlife biologist as the major breeding ground for a deer herd.

This requires definition of the magnitude, prevalence, duration, frequency, and likelihood of potential change.

Figure 3. Concept of screening as used in Canada (Federal Environmental Assessment Review Office, 1985).


SCREENING
AUTOMATIC EXCLUSION
INSIGNIFICANT ADVERSE EFFECTS
ADVERSE EFFECTS MITIGABLE
ABILITY TO MITIGATE UNKNOWN
EFFECTS UNKNOWN
SIGNIFICANT ADVERSE EFFECTS
SIGNIFICANT PUBLIC CONCERN
AUTOMATIC REFERRAL
INITIAL ENVIRONMENTAL EVALUATION
REFERRED TO MINISTER OF ENVIRONMENT FOR PUBLIC REVIEW
PROJECT PROCEEDS
ABANDON OR POSTPONE
MODIFY AND RESCREEN

To serve as a final example, the California Environmental Quality Act (CEQA) in the United States defines a significant effect on the environment as a substantial or potentially substantial adverse change in the physical environment (Bass and Herson 1991). Potential impacts are considered significant if a project would substantially: (1) degrade environmental quality; (2) reduce fish or wildlife habitat; (3) cause a fish or wildlife habitat to drop below self-sustaining levels; (4) threaten to eliminate a plant or animal community; (5) reduce the numbers or range of a rare or endangered species; (6) eliminate important examples of the major periods of Californian history or prehistory; (7) achieve short-term goals to the disadvantage of long-term goals; (8) have possible environmental effects that are individually limited but cumulatively considerable when viewed in connection with past, current, and probable future projects; and/or (9) have environmental effects that will directly or indirectly cause substantial adverse effects on human beings. Table 5 contains a detailed listing of effects normally considered as significant under CEQA (Bass and Herson 1991).

Table 4. Questions related to Significance Determination in Canada (Federal Environmental Assessment Review Office 1985)

1. Is the environmental component legally recognized as important?
   - environmental component is important if it is specifically protected by a law, policy, plan, control, or regulation; or is part of a legally defined management unit (e.g., a national park or an ecological reserve).
   - level of legal protection (i.e., federal, provincial, regional, or local) and the type of protection (i.e., law, plan, policy, control, or regulation) can affect the level of importance.
   - present legal status, the past and future predicted status.
   - environmental components legally identified as significant are commonly, also publicly, politically, and professionally, identified as important and, as such, usually rank high in relative importance.
2. Is the environmental component politically or publicly recognized as significant?
   - conditions affecting recognition of an environmental component as politically and publicly important:
     (a) conflict over the use(s);
     (b) resource availability and supply, and changes to that base;
     (c) demand and changes in demand; and
     (d) knowledge about the component and changes in that knowledge.
   - importance can be identified by any segment of the public, and the importance may be perceived rather than real.
   - assessment of the importance of an environmental component based on public input should consider:
     (a) who and how many consider the environmental component to be important;
     (b) the past history of the use;
     (c) the public's expectations of future use;
     (d) value of the environmental component to the public (monetary and otherwise); and
     (e) real or perceived importance.
3. Is the environmental component professionally judged to be important?
   - professional judgement may often form the only basis for recognizing the significance of an environmental component. Careful documentation of that determination is essential.
   - key aspects evaluated by the professional in analyzing importance of an environmental component include:
     (a) past, present, and projected future condition in the assessment area;
     (b) the condition in the context of the local area, the region, the province, the nation;
     (c) the size and extent of the environmental component;
     (d) scarcity;
     (e) monetary value; and
     (f) biological, physical, and socioeconomic attributes of the environmental component.

REVIEW OF SIGNIFICANCE DETERMINATIONS FROM VARIOUS COUNTRIES/AGENCIES

To obtain further information on the significance determination process, the EIA requirements of several countries and agencies (including international organizations) have been reviewed, and the details are presented elsewhere (Canter and Canty 1992). In this survey, a resource/impact was determined to be significant based on the preparation of an EIS or a similar formal document. This review resulted in the development of a categorization of the considerations used in significance determination. It was found that significance determination could be categorized into two approaches based on the criteria used.

Table 5 Effects Normally Considered as Significant Based on the California Environmental Quality Act (Bass and Herson 1991)

A project will normally have a significant environmental effect if it will:

- conflict with adopted environmental plans and community goals;
- have a substantial, demonstrable negative aesthetic effect;
- substantially interfere with the movement of resident or migratory fish or wildlife;
- breach published standards relating to solid waste or litter control;
- substantially degrade water quality;
- contaminate a public water supply;
- substantially degrade or deplete ground water resources;
- substantially interfere with ground water recharge;
- disrupt or adversely affect a cultural resource;
- induce substantial growth or concentration of population;
- cause a traffic increase that is substantial in relation to existing street traffic load and capacity;
- displace a large number of people;
- encourage activities requiring large amounts of fuel, water, or energy;
- use fuel, water, or energy wastefully;
- substantially increase ambient noise levels;
- cause substantial flooding, erosion, or siltation;
- expose people or structures to major geologic hazards;
- extend a sewer trunk line with capacity to service new development;
- substantially diminish habitat for fish, wildlife, or plants;
- create a potential public health hazard or expose people or animals and plants to hazards;
- conflict with established recreational, educational, religious, or scientific uses;
- violate any ambient air quality standard, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentrations;
- convert prime agricultural land to nonagricultural use or impair productivity of prime agricultural land; and
- interfere with emergency response plans or emergency evacuation.

For example, all decisions seemed to be founded upon either "predetermined" or "judgmental" criteria. These two main headings can be further subdivided to include more specific determination factors. Table 6 delineates the hierarchy of criteria based on this review.

Predetermined criteria as listed in Table 6 refer to preestablished or assumed thresholds of significance that have been created based on specific attributes of a project or from guidelines developed by regulating agencies. Use of previously developed criteria creates a defined threshold, thereby allowing for a systematic determination. This, in turn, reduces the speculation involved in decision-making. However, there may be limitations to this form of determination due to rigid thresholds. In some cases there may be projects (actions) with significant impacts or resources, but they are below the established level and, therefore, are excluded from assessment.

The second division in Table 6 refers to judgement criteria. Different actions have extenuating circumstances that will require decisions to be made based on analysis and professional discretion. In this instance, there are factors that can be partially quantified (such as effects on human and natural environments and the description of the impact), and factors that cannot be quantified, which require personal opinions or judgements. Either case can be used for defining significance. Judgement criteria include effects on the "environment," and decisions based on the "discretion of the decision-maker," and on an "impact basis." The environment is commonly used in significance determinations; this includes both the natural and human surroundings.

There are several opportunities for decision-maker discretion to arise within a proposed action. Actions involving environmental issues may comprise numerous ideas, uses, and plans that create controversy.

Different settings, such as local, regional, national, and international, can confound the problem. Therefore, significance is sometimes based on professional judgement, executive authority, the importance of the project/issue, sensitivity of the project/issue, and context; or by the controversy raised. Decisions of significance will not necessarily be determined on verifiable evidence, but may include "intuition." Finally, the characteristics of impacts resulting from a project can be used for significance assessment. Describing the impacts in terms of type, scale, complexity, intensity, and duration develops a basis for comparison and the application of judgement.

Table 7 includes a compilation of considerations in the significance definitions from several countries and agencies/organizations. As can be seen, there is no commonality of definitions; thus, this leads to environmental impact studies being inconsistently conducted from country-to-country, and within a country from agency-to-agency. However, if the principle of a case-by-case analysis is considered along with differing public values in different geographical locations, a uniform definition that would suffice for all projects in all locations would be inappropriate. The information in Table 7 is based on recent literature and reports along with some interpretation; the literature used as a basis for Table 7 included Asian Development Bank (1988), Boshard and Staveley (1981), Cutrera (1990), Duffy (1986), EIN Department (1984), Environmental Law Institute (1989), European Communities (1985), Gilpin and Lewis (1990), Lohani (1986), Ministry of Housing, Physical Planning and Environment (1984), Raman (1983), Srodowiska (1985), Wathern (1988), Welsh Office (1989), and Whitaker (1983).

SIGNIFICANCE DETERMINATION VIA A SEQUENCED APPROACH

Based upon the above reviews and examples, a sequenced approach for impact significance determination is suggested. A sequenced approach suggests several levels of consideration in determining the potential significance of impacts from a proposed federal action. This sequenced approach can be achieved via applying the series of questions as follows in the order shown (the answers to any questions can be used to determine if an EIS should be prepared):

1. Does the proposed project, plan, program, and/or policy cause impacts that exceed the definition of significant impacts as contained in pertinent laws, regulations or executive orders?

TABLE 6 Hierarchy of Significance Determination Criteria

- **I. PREDETERMINED CRITERIA**
  - A. ATTRIBUTES OF PROJECT
    - 1. Type
    - 2. Size
    - 3. Location
      - (a) urban/rural
      - (b) national park
      - (c) historic site
      - (d) archaeological
      - (e) sensitive area
        - i) wetlands
        - ii) tidal area
        - iii) preserves
        - iv) floodplain
        - v) coral reef
      - (f) science value
      - (g) educational
      - (h) deep scope
      - (i) farmlands
      - (j) residential
    - 4. Cost
    - 5. Resources
      - (a) loss of resource
      - (b) large scale energy use
      - (c) irreversible commitment
  - B. GUIDELINES/REGULATIONS
    - 1. Mandated significance
    - 2. Categorical exclusion
    - 3. Established laws/policies
      - (a) endangered species law
      - (b) wetlands protection law
- **II. JUDGMENTAL CRITERIA**
  - A. ENVIRONMENTAL CONSIDERATIONS
    - 1. Natural Environment (ecology)
      - (a) water
      - (b) air
      - (c) soil
      - (d) flora and fauna
      - (e) pollution
      - (f) microclimate
      - (g) endangered species
    - 2. Human Environment
      - (a) health and safety
        - i) nuisances
          - (1) noise
          - (2) smells
          - (3) vibration
        - ii) hazardous
        - iii) health risks
        - iv) natural calamity
      - (b) waste disposal
      - (c) social
        - i) aesthetics
        - ii) recreation
        - iii) livelihood
        - iv) lifestyle modification
        - v) quality of life
      - (d) cultural
        - i) religious
      - (e) population
        - i) growth
        - ii) distribution
        - iii) displacement
  - B. DISCRETION OF DECISION-MAKER
    - 1. Sensitivity of issue/project
    - 2. Importance of issue/project
    - 3. Controversial
    - 4. Context
    - 5. Executive authority
    - 6. Landuse conflict
    - 7. Precedence setting
    - 8. Short-term use vs. long-term use
  - C. IMPACT BASIS
    - 1. Size
    - 2. Type
      - (a) adverse
      - (b) beneficial
      - (e) direct vs. indirect
    - 3. Complexity
    - 4. Duration
    - 5. Intensity

2. Is a quantitative threshold criterion exceeded in terms of project, plan, or program type, size, or cost?

3. Is the project, plan or program located in a protected habitat or land-use zone, or within an exclusionary zone relative to land usage? Is the environmental resource to be affected a significant resource?

4. Is the proposed project, plan, program and/or policy expected to be in compliance with pertinent environmental laws, regulations, policies, and/or executive orders?

5. What is the anticipated percentage change in pertinent environmental factors from the proposed project, plan, or program, and will the changes be within the normal variability of the factors? What is the sensitivity of the environment to the anticipated changes; or is the environment susceptible or resilient to changes? Will the carrying capacity of the resource be exceeded?
6. Are there sensitive human, living, or inanimate receptors to the environmental stresses from the proposed project, plan, program, and/or policy?
7. Can the anticipated negative impacts be mitigated in a cost-effective manner?
8. What is the professional judgement of experts in the pertinent substantive areas, such as water quality, ecology, planning, landscape architecture, and archaeology?
9. Are there public concerns due to the impact risks of the proposed project, plan, program, and/or policy?
10. Are there cumulative impacts that should be considered or impacts related to future phases of the proposed action and associated cumulative impacts?

Detailed specific questions related to the above ten groups of questions can be developed. Examples of such questions or issues are contained in Tables 4 and 5, respectively.

Table 7. Considerations in Significance Definitions from Various Countries and Other Groups

ASIAN DEVELOPMENT BANK

Broad listing of types of projects (with reference to size) that are considered significant.

BELGIUM

Wallonia: Significance is based on type and size of the project, social considerations, and health and safety effects.

Flaunders: The Flemish Executive has authority to determine which projects require EIA and, therefore, which action is significant. This determination is based on the location of the project, economical and social impacts, health and safety effects, and the importance of the project.

BRAZIL

There are directives that provide a list of the activities for which EIA must be submitted (project type and size).

CHINA

Significance is defined by the type of project, but this is in regard to location, environmental impacts, social considerations, and health and safety effects.

COLOMBIA

There is a formal EIA process which has a list of projects that require environmental impact statements. Projects included are based on type, public health effects, nonrenewable resource development, and impacts on water quality.

DENMARK

Environmental impact procedures are not specifically instituted, but major construction projects require permits from environmental authorities—it can be assumed that a type and size significance determination is used.

EUROPEAN COMMUNITY (EC)

Specific projects with threshold levels are included on a listing of mandatory significance. This list is based on type, size, and location of project.

FRANCE

There is a listing of general and specific types (with size reference) of projects with mandatory significance. Other decisions are made based on: importance of project, potential environmental effects, and a monetary threshold. Potential environmental effects include the natural and human surroundings (environment). Further, the Ministry of the Environment may develop impact studies on its own initiative.

GERMANY (FEDERAL REPUBLIC)

EIA is not quite "formalized"; the Federal Council viewpoint is inconsistent and contradictory. However, significance is based on Appendix I Projects (EC) and type and size of the action.

INDIA

No formal requirement, but informal EIA procedure. Primary consideration is given to location of the project, social and ecological impacts, and health and safety concerns. There is also a monetary threshold.

IRAN

There is no specific law covering EIA, but there is legislation covering environmental protection. The Department of the Environment determines if projects require EIA. Six categories of projects have been defined that require EIA.

IRISH REPUBLIC

Significance is restricted to large-scale industry, actions that impact the environment ("...result in environmental emissions ...") and projects costing more than a specified amount. Only projects that require planning permission are considered in significance determinations. Some consideration for the EC Directive has been given.

ITALY

Actions listed in Appendix 1 of the EC Directive, along with a few additional projects, are predetermined to be significant. There is also regard for environmental factors, location of project, and health and safety concerns.

MEXICO

Legal provisions for EIA exist in Mexico; guidelines have a broad environmental scope. EIA significance is applied (determined) in accordance with the type, location, and potential impact of the project.

NETHERLANDS

Significance is determined based on the nature, scale and location of projects, social concerns, health and safety effects, and impacts on the environment.

PAKISTAN

No formal requirement, but informal procedure. EIA is required on a project-type basis.

PAPUA NEW GUINEA

No formal requirement, but informal EIA procedure. Two specific project types, mining and hydroelectric, have ad hoc EIA.

PERU

No environmental policy law. Current legislation deals with environmental problems, mainly pollution from mining operations. The focus has been limited to specific ecological factors - water and air quality.

SPAIN

In significance determination, the nature and location of the project, and the effects on the natural and human environment are considered. Some mandatory significance has been assigned to certain EC Directive projects.

SRI LANKA

No formal requirement, but informal procedure. EIA reports are required for manufacturing projects in Free Trade Zone.

UNITED KINGDOM

Recent adoption of an EIA Procedure (1988) has required certain projects by virtue of their nature, size, and location to be considered significant. There is also consideration for the natural environment, social concerns, and the nature and magnitude of impacts. In addition, certain projects require mandatory EIA, based on the EC Directive.

URUGUAY
No legal provisions for EIA; however, private and public organizations may ask for project evaluation. Several EIAs have been completed on agro-industry projects, tourist projects, and dams.

FORMER USSR
All new enterprises and renovation of existing facilities are required by legislation to examine impacts on air, water, and the human environment.

VENEZUELA
There is a legal system and institutional framework for the protection, conservation, and enhancement of the environment. EIA is required for projects that will produce either qualitative or quantitative significant impacts; this is in relation to size and location of projects. Most EIAs concern water management projects, mining, oil exploration, and coastal developments.

WALES
There are three main criteria of significance.

(1) context of project with attention to physical size;

(2) location of project (particularly in sensitive environs, i.e., parks); and

(3) potential effects on natural and human environments, i.e., pollution.

Also, there is a special list of projects that require EIA and a list that is dependent on the size, location, or scale of the project.

WORLD BANK
Projects are screened for significance based on nature, magnitude, and sensitivity of the environmental issue. Other factors, such as environmental management capability in the country are considered. There is a listing of types of projects that are significant.

OTHER USES OF SIGNIFICANCE DETERMINATION PROCESS

The focus of this paper has been on the use of the significance determination process to establish whether or not a comprehensive environmental impact study is needed on a proposed project, plan, program, and/or policy. While this is the primary usage of the process, several additional uses can be delineated; examples include: (1) identifying the impacts that should be mitigated; (2) selecting environmental variables for monitoring during a baseline and/or post-EIS monitoring and auditing study; and (3) documenting the interpretive rationale used during the conduction of the environmental impact study.

This paper is a condensed version of a paper by the same authors and with essentially the same title presented at the 12th Annual Meeting of the International Association for Impact Assessment, Washington, D.C., August 19-22, 1992.

REFERENCES

Asian Development Bank. 1988. *Environmental planning and management and the project cycle*. ADB Environment Paper No. 1, Manila, The Philippines, pp. 15-17.

Bass, R.E., and Herson, A.I. 1991. *The California Environmental Quality Act: A step-by-step approach*. Sacramento: Jones and Stokes Associates, pp. 2-19 to 2-22.

Boshard, J.H., and Staveley, P. 1981. Integration of environmental planning and impact assessment procedures in New South Wales. In *Environmental Assessment in Australia and Canada*, S.D. Clark (ed). Vancouver, British Columbia: Westwater Research Center, pp. 60, 61, 107.

Canter, L.W., and Canty, G.A. 1992. *Determination of impact significance - principles and examples*. October,1992. Environmental and Ground Water Institute, University of Oklahoma, Norman, Oklahoma.

Council on Environmental Quality. 1987. 40 *Code of Federal Regulations,* Ch. V, U.S. Government Printing Office, Washington, D.C., pp. 929-971.

Cutrera, A. 1990. *European Environmental Yearbook,* London: Doctor International.

Duffy, P.J.B. (ed). 1986. *Initial assessment guide: Federal environmental assessment and review process.* Federal Environmental Assessment Review Office, Ottawa, Ontario, Canada, pp. 9-24.

EIN Department. 1984. In-Country EIA: Netherlands. *EIA Worldletter* 1(4-6).

Environmental Law Institute. 1989. *NEPA Deskbook,* Washington, D.C., pp. 106-239.

European Communities. 1985. Council directive of 27 June, 1985, on the assessment of the effects of certain public and private projects on the environment. *Official Journal of the European Communities.* No. L 175, Brussels, Belgium, pp. 4-48.

Federal Environmental Assessment Review Office. 1986. *Initial assessment guide.* Ottawa, Ontario, Canada.

Federal Environmental Assessment Review Office. 1985. *Initial environmental assessment: Procedures and practices.* Toronto, Ontario, Canada, pp. 8-20.

Gilpin, A., and Lewis, J.L. 1990. *Environmental impact assessment in Taiwan and Australia - A comparative study.* Working Paper No. 20, Environment and Policy Institute, Honolulu, Hawaii.

Lohani, B.N. 1986. Status of environmental impact assessment in Asian and Pacific region. *EIA Worldletter* November/December: 7-13.

Ministry of Housing, Physical Planning and Environment. 1984. *Environmental impact assessment in the Netherlands.* The Hague, The Netherlands, pp. 8-15.

Moore, S.N. 1992. Significance and the National Environmental Policy Act. *National Association of Environmental Professionals Newsletter.* 17(3):8-9.

Principles and Guidelines. 1983. *Economic and environmental principles and guidelines for water and related land resources implementation studies.* Executive Office of the President, Washington, D.C.

Raman, V. 1983. In-country EIA: India. *EM Worldletter* 1(3):3-4.

Srodowiska, O. 1985. In-country EIA: Poland. *EIA Worldletter* 2(2):2-3.

U.S. Army Corps of Engineers. 1983. *A guide to the analysis of significance.* Environmental Resource Section, Seattle District, Seattle, Washington.

U.S. Army Corps of Engineers. 1988. Environmental quality: Procedures for implementing the National Environmental Policy Act, (NEPA). *Federal Register* 53(22):3120-3137.

U.S. Environmental Protection Agency. 1989. *Facts about the National Environmental Policy Act.* LE- 133, Washington, D.C.

Wathern, P. (ed). 1988. *Environmental Impact Assessment: Theory and Practice,* Boston: Unwin Hyman.

Welsh Office. 1989. Environmental assessment - A guide to the procedures. London: HMSO Publications Center, pp. 4-7; 25-34.

Whitaker, C. 1983. In-country EIA: South Australia. *EIA Worldletter* 1(1):2-4.

World Bank. 1989. Operational directive 4.00, annex A3, *Environmental Screening.* Washington, D.C.

Screening

Screening is the process of determining whether or not a proposal requires full-scale EIA and the level at which that assessment should occur.

Typical proposals requiring full-scale EIA:

- exploitation of natural resources
- infrastructure
- industrial activities
- extractive industries
- waste managment and disposal
- substantial changes in farming or fishing practices

Screening methods

- decision-makers' discretion
- initial environmental examination
- project lists with/without thresholds
- exclusion lists

Screening information required by decision-makers

- information about the proposal and its potential impacts
- level of confidence in impacts
- characteristics of the environment and its resilience to change
- planning, environmental management and decision-making framework
- degree of public interest

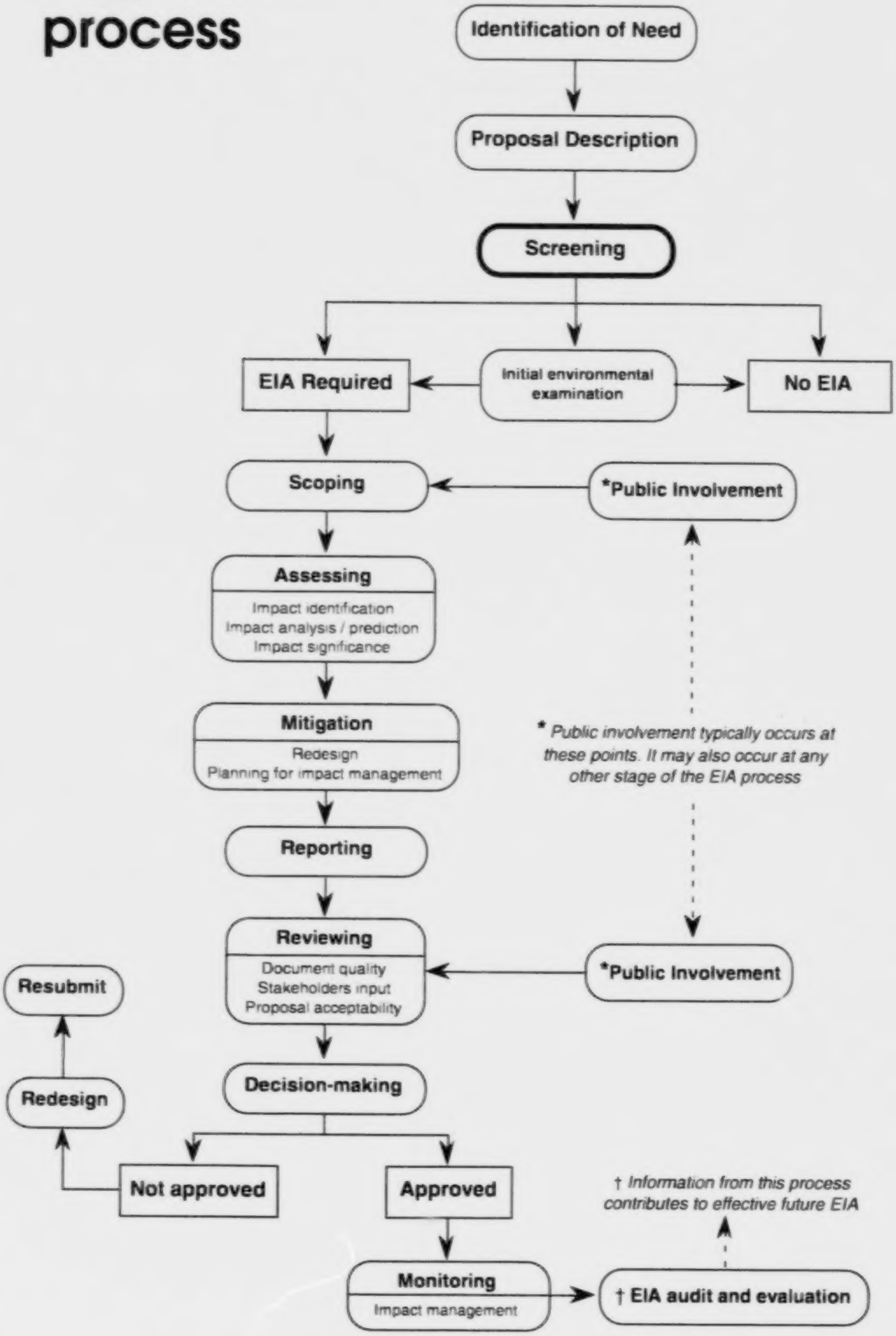
An Initial Environmental Examination (IEE)

- describes the proposal and examines alternatives
- identifies and addresses the concerns of the community
- identifies and assesses the potential environmental effects
- mitigates adverse effects and enhances potential benefits
- contains environmental monitoring and management plans

Typical project list categories

- full-scale EIA required
- some further environmental analysis required
- no further environmental analysis required

Screening in the EIA process



Identification of Need

Proposal Description

Screening

EIA Required

Initial environmental examination

No EIA

Scoping

*Public Involvement

Assessing

Impact identification
Impact analysis / prediction
Impact significance

Mitigation

Redesign
Planning for impact management

Reporting

Reviewing

Document quality
Stakeholders input
Proposal acceptability

*Public Involvement

** Public involvement typically occurs at these points. It may also occur at any other stage of the EIA process*

Decision-making

Not approved

Redesign

Resubmit

Approved

Monitoring

Impact management

† EIA audit and evaluation

† Information from this process contributes to effective future EIA

Topic 5 — Scoping

Objective

To develop an understanding of:

- ☐ the role of scoping in EIA;
- ☐ the key components of scoping;
- ☐ common methods of approaching scoping;
- ☐ the typical outcomes resulting from the scoping phase;
- ☐ establishing boundaries for the problem in space and time; and
- ☐ setting the terms of reference for EIA studies.

Relevance

Scoping is a vital early step in the preparation of an EIA. The scoping process identifies the issues that are likely to be important during the EIA and eliminates those that are not. In this way time and money are not wasted on unnecessary investigations.

Timing

Three hours (not including training activity)

☑ Information checklist

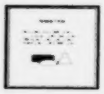
Obtain or develop the following, as appropriate:

- ☐ details of local approaches used for scoping, and examples of approaches used in other countries in the region;
- ☐ examples of scoping programmes which have been undertaken locally, and which demonstrate good and bad practice;
- ☐ government regulations or policies, procedural, technical and sectoral guidelines for Terms of Reference, stakeholder involvement techniques, and information management systems etc used during scoping;
- ☐ indications of the resources necessary to support scoping, in terms of time, people and money;
- ☐ copies or results of any research focused on the scoping phase of EIA;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information that data resource centres who may be able to provide assistance in scoping; and
- ☐ other resources that may be available such as courses in specific analytical or methodological techniques, videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives and why they are important.

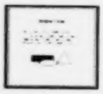
Scoping is a vital early step in the preparation of an EIA. The scoping process identifies the issues that are likely to be important during the EIA and eliminates those that are not. In this way time and money are not wasted on unnecessary investigations.



1

Outline the place of scoping in the EIA process and encourage the participants to develop a definition of scoping as it relates to them. Note that there is often a confusion in terminology between the names for the different early stages of the EIA process (screening, scoping, impact identification). Observe that this does not matter as long as the basic elements of EIA are present in the process.

'Scoping' is a process of interaction between the interested public, government agencies and proponents.



2

Scoping refers to the process of identifying, as early as possible:

- the appropriate boundaries of an EIA study
- the important issues and concerns (interests)
- the information necessary for decision-making, and
- the significant effects and factors to be considered.[1]

Scoping is a process within which various methods are applied to:

- identify community and scientific concerns about a proposed project or action;
- evaluate these concerns to determine the key issues for the purpose of the environmental impact assessment (and to eliminate those issues which are not significant); and
- organize and communicate these to assist in the analysis of issues and the ultimate making of decisions.[2]

It should be noted that, in some jurisdictions, the concepts of screening and scoping are merged. Indeed the techniques and procedures for screening and scoping have marked similarities, and the information resulting from screening will often provide the basis for scoping.

Commonly, scoping is considered to be completed when a document (often in the form of a Terms of Reference [ToR]) is produced setting out what the EIA is to cover and how it is to be managed. Experience shows that Terms of Reference should not be rigid documents. They need to be flexible enough to either increase or decrease the scope of investigations as new issues emerge or others are reduced in importance.

Involve the group in exploring the purpose of scoping in EIA.

The scoping process will serve to facilitate an efficient EIA process by identifying key issues, concerns and alternatives which require investigation. This information will allow those responsible for the EIA to properly brief the study team on the matters which should be addressed in the study. It will also reduce the likelihood that the EIA document will have serious deficiencies, and the attendant delay if it needs to be revised. Scoping is done to make sure that neither time nor money is wasted collecting unnecessary baseline data or undertaking excess analysis, and that important issues are not neglected.

A comprehensive approach to scoping can have the objectives listed below. It is not always necessary, however, for scoping to be quite so complex.

3

Scoping can be used to:

- consider reasonable and practical alternatives;
- inform potentially affected people of the proposal and the alternatives;
- identify the possible effects on the environment of the proposal and the alternatives;
- identify the possible effects on people of predicted environmental changes;
- understand the values about the quality of the environment held by individuals and groups that might be affected by the proposal and the alternatives;
- evaluate concerns expressed and the possible environmental effects for the purpose of determining how and whether to pursue them further;
- define the boundaries of any required further assessment in time, space and subject matter;
- determine the nature of any required further assessment in terms of analytical methods and consultation procedures;
- organize, focus and communicate the potential impacts and concerns, to assist further analysis and decision-making; and
- establish the Terms of Reference to be used as the basis of the ongoing assessment.[3]

Outline the different ways in which scoping can be managed and note that, although the main emphasis of scoping is early in the EIA, the process of reevaluating the importance of issues usually continues throughout the EIA process.

The approach chosen for scoping needs to take into account local values, traditions and culture. Depending upon the EIA system, responsibility for scoping may lie with the proponent, or with the EIA authority, or with an expert group set up for the purpose. In most cases there will be some reliance on previous experience, represented in part by existing scoping documentation for a similar proposal, sectoral guidelines and checklists.

None of these aids can, however, replace the need for an inspection of the site, and careful thought about the proposal and its likely consequences.

Scoping requires proper consideration of the proposal and its site, the possible alternatives, the likely impacts, and the ways potential impacts may be mitigated or managed. Issues such as the geographical area to be considered, the time-frame for impact analysis, the methodologies to be used, sources of existing information and information gaps, the timing of the EIA study phases, and the decision-making process that will be used should all be addressed. Proposals for public involvement in the study (including the scoping phase) should be set out clearly.

It is sometimes easy to overlook long-term and secondary impacts of proposals. Waste discharged into the air or waterways can extend a long way beyond the boundaries of a project, and heavy metals can accumulate in species which are an important source of food.

The identification of potential impacts will be assisted by systematic consideration of the various phases of the project life cycle: construction, operation and decommissioning.

The end result of the scoping phase may be expressed as a formal document, such as Terms of Reference, or may be a more informal document such as the proponent's revised scoping framework. The agreed scope may be the basis for the development of a detailed consultant brief. Whether formal or informal, the test for the scoping framework is its usefulness and robustness, as demonstrated throughout the successive stages of the EIA process.

While scoping is seen as a distinct early activity within EIA, review of the scope is a continuous activity that proceeds throughout the detailed EIA studies, the decision-making, detailed design, implementation and monitoring. Unforeseen issues may arise in any of these phases, and will require further consideration. Also, within a particular issue (indigenous flora or air pollution, for example), the work undertaken for the EIA may uncover successive layers which will pose questions for the study team, and represent potential areas of conflict among the stakeholders, scientists and wider public. Questions within each issue, such as the type and extent of data collection, the way the data are analysed, the significance of the data, the importance of the issue, the representativeness of what has been sampled, the standards adopted, and the appropriateness of suggested mitigating measures may all be subject to debate and dispute. Ultimately there are no 'right' answers to these questions, just a succession of judgements which try to balance the available resources for the study (both time and money) with the legitimate concerns of the participants.

Explore with the group the steps in the scoping process.

4

A typical list of steps for scoping is:

1. Prepare an outline of the scope, with headings such as:
   - objectives and description of the proposal
   - the context and setting of the proposal

- constraints
- alternatives
- issues
- public involvement (in scope), and
- timetable

2. Further develop the outline of the scope through discussion with the proponent, the EIA authority, and other key stakeholders, assembling available information, and identifying information gaps.
3. Make the outline and supporting information available to those whose views are to be obtained.
4. Identify the issues of concern.
5. Evaluate the concerns from both a technical and subjective perspective, seeking to assign priority to the more important issues.
6. Amend the outline to incorporate the agreed suggestions.
7. Develop a strategy for addressing and resolving each key issue, including information requirements and terms of reference for further studies.
8. Provide feedback on the way comments have been incorporated.

(These steps are only indicative, and should be tailored to meet the requirements of the particular situation.)

Ask the group to outline the possible roles in scoping of the various stakeholders in the EIA process. 5

The proponent:
usually knows most about the proposal, and will have a strongly developed view about the factors that will influence the site selection and other decision-making. It is common for the proponent to have responsibility for scoping, and where this is not the case the proponent's involvement is important. The scoping process will assist the proponent to recognize the perspective of others, to consider alternatives and issues of concern which are raised by those affected, and to make changes to the proposal which will both address the concerns raised and improve the proposal.

The administering authority:
will generally have statutory or procedural requirements for scoping, and usually a wealth of experience. The requirements for scoping may cover the matters to be addressed, the people to be consulted, and the form of consultation. The administering authority may issue directions on the scope of the EIA, or may review and approve the scope of the EIA proposed by the proponent. Either way, the administering authority will usually have responsibility for checking the completed EIA against the agreed scope.

Other agencies:
will contribute detailed knowledge about specific issues within their jurisdiction. This knowledge may include specific legislation and policy frameworks, standards, data collections, methodologies, local knowledge

and experience. Quite often the sectoral agencies may have the role of providing licences, permits, approvals or leases, so knowledge of their requirements is essential.

Environmental practitioners and experts:
may act for the agencies involved, the proponent, or consultants bidding for the work, or they may belong to scientific, academic or professional bodies. The involvement and advice of these people can be of particular assistance in providing specialist knowledge.

Those affected:
by the proposal have a major role in identifying issues and ensuring that local knowledge and values are understood. The views of these people should be taken into account in choosing between alternatives, in deciding on the importance of issues, and in framing mitigating measures, compensation provisions and management plans. Affected communities may need help in understanding the proposal, its alternatives, and their likely effects, and in organizing and relating to the EIA process, and articulating their concerns. They may need the provision of community liaison people and financial resourcing to allow them to participate.

The wider community:
including those indirectly affected, and local, national and sometimes international NGOs and interest groups will also provide a source of useful information and values, as this can assist the thoroughness of the scoping.

Aspects relevant to two-way communication with stakeholders are detailed in Topic 3 *Public Involvement*. Many of the following public involvement methods are applied to scoping:

- group meetings of representatives of the various stakeholders
- workshops, seminars
- interdisciplinary team meetings
- public meetings
- seeking individual public responses to written documents

Discuss ways in which the investigation of alternatives can be undertaken.

The need to consider alternatives is a common aspect of most EIA systems.

A rigorous approach to the consideration of alternatives is more commonly associated with proposals from the public sector, where the allocation of public funds and priorities is recognized as a legitimate public interest. Private sector proposals have not generally had the same attention paid to the matter of alternatives, since there has been a perception that the choice of project is a matter for the developer who is putting up the money.

Increasingly as EIA matures, and considerations of sustainability, strategic assessment and cumulative effects take on greater importance, so too will the consideration of alternatives. Such consideration is most likely to be effective when the EIA is undertaken at the feasibility stage, rather than at a time when the proponent has developed firm views on the form and location of the proposal, and is simply seeking statutory approval.

6

Alternatives are generated and examined to determine the best method of achieving project objectives, while minimising environmental impacts. They can be grouped under such headings as:

- demand alternatives (eg using energy more efficiently rather than building more generating capacity);
- activity alternatives (eg providing public transport rather than increasing road capacity);
- location alternatives, either for the entire proposal or for components (eg the location of the processing plant for a mine);
- process alternatives (eg the re-use of process water in an industrial plant, waste-minimising or energy efficient technology, different mining methods);
- scheduling alternatives (where a number of measures might play a part in an overall programme, but the order in which they are scheduled will contribute to the overall effectiveness of the end result); and
- input alternatives (eg raw materials, energy sources).[4]

A systematic approach to the generation of alternatives could follow the headings above. Knowledge of available technology, policy and societal attitudes, site constraints, project economics and evaluation methods will all contribute to the development of alternatives which warrant further consideration. The usefulness of wide consultation should not be underestimated in generating alternatives, in assessing the likely impacts associated with them, and in determining the values which will contribute to evaluation between the alternatives.

The 'no-build' alternative is often used as a base case against which to measure the relative performance of other alternatives. In this case the relative impacts of the other alternatives are expressed as changes to the base case. If, overall, all the alternatives were judged to have unacceptable performance, the decision would be to adopt none of them, and stay with the status quo – the 'no-build'. Alternatively a base case (which may be slightly different to the 'no-build' in the sense that it might take account of anticipated likely demographic and infrastructure changes) might be taken forward in its own right for evaluation against the defined objectives.

Not all alternatives will be investigated in the same detail. It is quite common to undertake a preliminary analysis of a wide set of alternatives to decide which ones should be carried forward for further consideration, and which ones should be discarded. In many EIA studies, the favoured alternative will be most closely examined, and only that alternative will be considered in detail. It is not uncommon, however, for a number of alternatives to be investigated at the same level of detail, and for the decision on the favoured alternative to be made on that basis. Some EIA systems allow proponents to defer choosing a preferred alternative until after they have received public comments and the findings of the review.

Box 1: Analysis of alternatives

Argentina Yacyreta II

The main environmental issue in this large hydropower scheme project, primarily involving installation of the turbines, was whether it would be environmentally and socially more costly to complete the project at this late stage, rather than cancel it and invest in other alternatives. Analysis showed that the costs of completing the project were significantly lower than other possibilities, but also specified mitigation, monitoring and management measures required to make the project acceptable to the Bank.

Indonesia Semarang-Sukarta Urban Development Project

An analysis of site alternatives for a proposed waste water treatment plant resulted in changing the plant's location.

Colombo Environment Project in Sri Lanka

Substantial redesign of some public works occurred as a result of the EA analysis of alternatives.

Croatia Highway Project

The EA considered six options for road alignment on the basis of their likely impact on agricultural land, forest habitat, watercourses, settlements, and air, water, soil and noise pollution. A rating system was developed to rank the variants and the findings were presented at public meetings. The final choice was modified by addition of two tunnels to further reduce the impacts on the landscape.

From The World Bank (1995)

Ask the group to identify the types of information that could be required by Terms of Reference for an EIA

7

5–1

Terms of Reference for the EIA are a common outcome of the scoping phase, and should clearly identify the work to be done and responsibility in undertaking the EIA study whilst maintaining some flexibility to adapt to changes if necessary. The Development Assistance Committee of the OECD has established a draft framework for Terms of Reference (see Handout 5–1 for full details), the main components of which are:

- background to the proposal;
- setting the context for the problem (proposed solution, cooperation amongst jurisdictions, objectives of the EIA, legal/policy basis and institutional capacity for EIA);
- alternatives (to the project, within the project);
- institution and public involvement;
- required information and data (project description, description of environment, quality of information);
- analysis of impacts (positive, negative: natural resources, human resources, relocation and compensation, cumulative impacts, transboundary impacts, impact significance);
- mitigation and monitoring (impact management plan, environmental monitoring plan); and

- conclusions and recommendations (project decision, technical matters, non-technical summary).

The Terms of Reference can also contain various matters relating to project management, such as:

- the proposed study schedule;
- the budget allowed for the study;
- the expected outputs (interim and final reports, format of the environmental impact statement, number of copies); and
- the basis on which variations to the brief will be negotiated.

Topic 12—*Project Management* gives more detail on the management of projects, including the building of a team, budgeting and reporting.

Include a training activity to reinforce the topic (if desired).

Conclude by summarizing the presentation and previewing the next topic

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Sadler, B. (1995) *Initial Perspectives on EIA Process Strengthening*, International Study of the Effectiveness of Environmental Assessment. Canada

2. Federal Environmental Assessment Review Office (1987) *Determining the Scope of Environmental Impact Assessments*. Environmental and Social Systems Analysts Ltd. Vancouver

3. Ministry for the Environment (1992) *Scoping of Environmental Effects*. Wellington, New Zealand

4. Tomlinson, P. (1984) The Use of Methods in Screening and Scoping, in *Perspectives on Environmental Impact Assessment*, ed Clarke, B. D. et al. Reidel. Dordrecht

US Council on Environmental Quality (1981) *Memorandum: Scoping Guidance*. Washington DC. 19pp.

The World Bank (1995) *Environmental Assessment Challenges and Good Practice*. Paper no. 018. Washington

OECD/DAC (1994) *Towards Coherence in Environmental Assessment. Results of the Project on Coherence of Environmental Assessment for International Bilateral Aid*. Canada

Further reading

Australian and New Zealand Environment and Conservation Council (1993) *Guidelines and Criteria for Determining the Need for, and Level of, Environment Impact Assessment in Australia*. Canberra

Beanlands, G. (1992) *Scoping Methods and Baseline Studies in EIA*. In 'Environmental Impact Assessment Theory and Practice'. Ed Wathern P. pp 33–46.

Bisset, R. (1996) *EIA: Issues, Trends and Practice*. The Environment and Economics Unit UNEP. Nairobi

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

The World Bank (1991) *Environmental Assessment Sourcebook*, World Bank Technical Papers Nos. 140 and 154. The World Bank. Washington

United Nations ESCAP (1990) *Environmental Impact Assessment*. Environment and Development Series. Bangkok:
- *Guidelines for Agricultural Development* (ST/ESCAP/783)
- *Guidelines for Industrial Development* (ST/ESCAP/784)
- *Guidelines for Transport Development* (ST/ESCAP/785)
- *Guidelines for Water Resource Development* (ST/ESCAP/786)

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

5-1 'The scoping phase should result in a conclusive list of matters which will be addressed in the EIA study; issues suggested at later stages should not be considered.' Is this view tenable?

5-2 Why is it important to define the purpose and objectives of a proposal, and the alternatives to be considered? Do these reasons apply equally to private and public sector proposals? What about proposals like mining where the location of the ore body is fixed?

5-3 'Sectoral guidelines can obviate the need for scoping.' Explore how scoping practices might supplement such general guidelines in a particular case.

5-4 Discuss the difference between primary and secondary impacts, in relation to a dam, a tourism facility, a major highway, a nuclear power station and a paper mill.

5-5 How much information should the proponent have assembled before scoping commences? Can the proponent collect too much information too early, and if so, what are the likely consequences?

5-6 Who should make decisions on the relative significance of issues? What factors will influence such decisions?

5-7 What sources of data should be investigated prior to scoping? Why is it necessary to identify data gaps, and to collect data in such areas? How can different data needs affect the time and cost of EIA studies?

Speaker themes

5-1 Invite a project manager for a large development company or a consultant to talk about the firm's experiences with scoping for an EIA. What were the steps that were taken? Did the list of key issues identified through scoping need to be extended during the later stages of the study? How useful was the involvement of local people compared to the assistance of EIA experts? What changes were made to the initial proposal as a result of the issues generated during the scoping phase, and the later in-depth investigation of those issues?

Group Activity 5-1: Scoping

Title	**Scoping a proposed development**
Aim	To develop an appreciation of the scoping process by undertaking scoping for a local project (real or hypothetical).
Group size	Four to six people
Duration	Half day to whole day (as required)

Resources required

- A case study description of a (real or hypothetical) proposal, with some details of its setting.
- The notes on scoping provided to the course participants, together with some form of checklist or sectoral guidelines.

Description of activity:

Each member of the small group will take a role, eg. that of the proponent, EIA administering agency officer, resource agency officer, directly affected local community member, and a representative of a regional NGO that has a direct interest in the proposal.

Using the case study provided:

- each member of the group should separately consider, from the perspective of their role, the range of alternatives that might be considered (consult the categorisation of types of options in the notes - demand, activity, location, process etc.);
- discuss the range of alternatives generated, and agree which ones should be taken forward for further study;
- each member should make a list of the likely impacts of the proposal. Compare the lists and reach consensus on the key issues;
- select three of the key issues, and detail the study programme necessary to adequately address each issue; and
- prepare Terms of Reference for the EIA study, covering the agreed alternatives and the three selected issues.

Group Activity 5-2: Scoping

Title	**Launching the scoping process**
Aim	To explore the information needs at the beginning of the scoping process
Group size	Three or four people
Duration	Half-day in total comprising one hour's preparation, and a further one hour during which each group can make their presentation (10 to 15 minutes per group). Conclude with a general discussion of the merits of each presentation.

Resources required

- Brief case study description of a proposal, the setting and the nature of the surrounding communities.

Description of activity:

Participants are required to develop a presentation to a meeting of local residents (the rest of the group), at which the proposal is to be unveiled, and the scoping process commenced. The presentation should be planned to cover:

- the objectives of the proposal;
- how the local community will benefit from the proposal;
- the likely impacts of the proposal and how they will be managed;
- how the community will be given the opportunity to voice their concerns, and will be consulted in the further development of the proposal;
- the way the proponent intends to investigate the key issues, assemble the study team, and the studies to be undertaken; and
- the timetable proposed, and the decision-making process.

1

Flowchart of the EIA process

2

Scoping:

- is a process of interaction
- identifies
  - boundaries of the EIA study
  - important issues of concern
  - the necessary information for decision-making
  - significant effects and factors to be considered
- identifies concerns, evaluates them, organizes and presents them to assist analysis and decision-making

3

The purpose of scoping in EIA

- consider reasonable and practical alternatives
- inform potentially affected people
- identify possible effects
- understand local values
- evaluate concerns expressed
- define the boundaries of the EIA study
- determine the analytical methods and consultation procedures
- establish procedures for consultation and analysis
- establish the Terms of Reference

4

Steps in the scoping process

1. Prepare an outline of the scope
2. Develop the outline through informal discussion
3. Make the outline widely available
4. Identify issues of concern
5. Evaluate the concerns
6. Amend the outline to incorporate the concerns
7. Develop a strategy for addressing the key issues
8. Provide feedback to participants

5

Who should be involved in scoping?

- the proponent
- the administering agency
- other agencies
- environmental practitioners and experts
- those affected
- the wider community

6

Investigating alternatives

- demand alternatives
- activity alternatives
- location alternatives
- process alternatives
- scheduling alternatives
- input alternatives

7

Outline of a Terms of Reference:

- background to the proposal
- setting the context for the problem
- alternatives
- institution and public involvement
- required information
- analysis of impacts
- mitigation and monitoring
- conclusions and recommendations
- requirements for managing the EIA

A FRAMEWORK TERMS OF REFERENCE FOR ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT ASSISTANCE PROJECTS

(From OECD/DAC, (1994) Towards Coherence in Environmental Assessment — Results of the Project on Coherence of Environmental Assessment for International Bi-lateral Aid. Canada)

TOPICS TO BE ADDRESSED	BASIC REQUIREMENTS	PROCEDURAL CONSIDERATIONS	OPERATIONAL CONSIDERATIONS	PROJECT STAGES
A. INTRODUCTION				
1. BACKGROUND	*Introduce the project and the most critical environmental issues involved.*	Briefly review the events leading up to the conduct of the assessment.	List the main participants in the assessment process.	Concept (i) Prefeasibility (s) Feasibility (s)
B. CONTEXT				
2. THE PROBLEM	*Summarise the basic developmental issue or problem being addressed by the proposed activity, i.e., pollution, flooding, drought, erosion, energy shortage, poor health, depressed economy, etc.*	Characterise the issue or problem in its broader national context, i.e., historical perspective, root causes, implications for development, and prior attempts at resolution.	As they become available, use results from the environmental assessment to refine the problem statement.	Concept (i) Prefeasibility (s) Feasibility (s)
3. PROPOSED SOLUTION	*Summarise the way in which the proposed activity is expected to resolve the issue, or solve or alleviate the problem, with the emphasis on sustainability.*	Describe the critical requirements for the proposed activity to be successful in the long-term, and identify the major risks and benefits involved.	Identify the technical or operational aspects of the project that are most problematic in terms of achieving sustainability.	Concept (i) Prefeasibility (s) Feasibility (s)
4. CO-OPERATION AMONG JURISDICTIONS	*Summarise the agreement or arrangements between the donor(s) and the recipient country under which the environmental assessment is being conducted.*	Describe the sharing of roles and responsibilities, emphasising the lead role to be played by the recipient country in the conduct of the assessment.	Provide a brief overview of other relevant past cooperative efforts between the donor and the recipient country, including strategies for capacity development.	Concept (i) Prefeasibility (s) Feasibility (s)
5. OBJECTIVES OF THE ASSESSMENT	*State clearly the objectives of the assessment and the relationship of the results to project planning, design, implementation and follow-up.*	For donor and recipient country, highlight critical points in the decision making process linking environmental assessment and project execution.	Note those aspects and outcomes of the project which are considered most likely to be affected by the results of the assessment.	Prefeasiblity (s) Feasibility (s)
C. INSTITUTIONAL SETTING				
6. LEGAL/POLICY BASE	*Summarise the legal, policy and procedural bases for environmental assessments in the recipient country and the donor agency.*	Identify potential areas of conflict or disagreement and describe how these have been, or can be, overcome.	Ensure agreement on sensitive issues, such as pollution standards, criteria for impact evaluation, relocation and compensation.	Concept (i) Prefeasibility (s) Feasibility (s)

Key
s - if stage occurs concurrently with assessment
r - influenced by results of assessment
i - information sources for the assessment

Framework Terms of Reference for Environmental Assessment of Development Assistance Projects

TOPICS TO BE ADDRESSED	BASIC REQUIREMENTS	PROCEDURAL CONSIDERATIONS	OPERATIONAL CONSIDERATIONS	PROJECT STAGES
7. INSTITUTIONAL CAPACITY	*Summarise and provide an appraisal of the strengths and limitations of the recipient country in the various fields of environmental protection and management.*	Assess capacity and past experience of institutions in managing domestic and foreign assistance projects; identify capacity building needs (including training).	Focus on key aspects, including the number and competency of staff, size of operational budgets and availability of appropriate technology and equipment.	Concept (i) Prefeasibility (s) Feasibility (s)
D. ALTERNATIVES				
8. ALTERNATIVES TO THE PROJECT				
(a) Policy Interventions	*Assess the potential for achieving the basic developmental objective by interventions at the policy level.*	Evaluate options such as using economic instruments, controlling supply and demand, and encouraging reuse/recycling.	Identify key potential constraints, such as lack of expertise, and inefficient administrative systems.	Concept (i) Prefeasibility (s) Feasibility (s)
(b) Other Projects	*Assess the potential for achieving the basic developmental objective by implementing other projects which are substantively different than the one proposed.*	Assess reasonable options, such as alternative sources (for energy projects), alternative modes (for transportation projects) and alternative practices (for agricultural projects).	Identify key constraints, such as the inadequacies of existing infrastructure, time limitations and a lack of financial resources.	Concept (i) Prefeasibility (s) Feasibility (s)
9. ALTERNATIVES WITHIN THE PROJECT	*Evaluate potential alternatives for key aspects of the proposed project, i.e., options for siting, waste management, energy conservation and pollution control technologies.*	Assess the potential to implement such alternatives, depending upon the specifics of the project and the design options available.	Identify the most reasonable alternatives and incorporate them into the detailed analysis of environmental impacts.	Prefeasibility (s) Feasibility (s)
E. INSTITUTIONAL AND PUBLIC INVOLVEMENT				
10. INSTITUTIONAL COOPERATION	*Show clearly how the proposed project conforms with the overall development strategy and priorities of the recipient country.*	Describe the manner and extent to which other government institutions in the recipient county were consulted or participated in the assessment.	Describe the procedures used to gain access to information held by other agencies, and to what extent they were successful.	Prefeasibility (s) Feasibility (s)
11. PUBLIC INVOLVEMENT	*Show how affected groups and NGOs in the recipient country, and interested publics in the donor country, were given the opportunity to participate in the assessment process.*	Explain the manner in which information was distributed to, and received from, members of the public, and how that information was used in project planning.	Describe efforts at public scoping, and explain how the results were used to focus the assessment on critical issues, particularly in regard to collection and interpretation of data.	Prefeasibility (s) Feasibility (s)

Key
s – if stage occurs concurrently with assessment
r – influenced by results of assessment
i – information sources for the assessment

Framework Terms of Reference for Environmental Assessment of Development Assistance Projects

TOPICS TO BE ADDRESSED	BASIC REQUIREMENTS	PROCEDURAL CONSIDERATIONS	OPERATIONAL CONSIDERATIONS	PROJECT STAGES
F. REQUIRED INFORMATION AND DATA				
12. DESCRIPTION OF PROJECT	*Describe the project (design life, location, layout, size, capacity, activities) inputs (land, raw materials, energy) and outputs (products, by-products, emissions).*	Identify indirect impacts arising from induced changes in land use or ownership and from utilisation of local natural resources as raw material for the project.	Identify and quantify sources of impacts, i.e., emissions, effluents, waste products and noise, with particular emphasis on toxic materials.	Prefeasibility (s) Feasibility (s)
13. DESCRIPTION OF ENVIRONMENT	*Identify study boundaries which can provide baseline data on relevant (as determined from scoping results) physical, ecological, economic, social, cultural and demographic conditions within those boundaries.*	Clearly show how information received from the general public through a scoping process was used to limit and focus baseline studies on the important issues.	Identify and quantify receptors of impacts, i.e., components of ecological systems at risk, vulnerable human groups (and sub-groups) and valued resources.	Prefeasibility (s) Feasibility (s)
14. INFORMATION QUALITY	*Assess the quality of all information, identify data gaps, and summarise the limitations placed on the assessment from such deficiencies.*	Recommend measures to ensure that important data bases of reliable quality will be established and maintained for future projects.	Where appropriate and feasible, design the monitoring plan for the proposed project to fill the identified data gaps.	Prefeasibility (s) Feasibility (s) Monitoring and Evaluation (r)
G. ANALYSIS OF IMPACTS				
15. POSITIVE IMPACTS	*Predict how the lives of the affected people will be improved and any enhancement of natural systems resulting from project implementation.*	Focus on values determined through scoping, i.e., traditional economy, improved health, better living conditions, conservation of local ecosystems.	Use quantitative analysis where possible; take account of past trends and experience with similar projects.	Prefeasibility (s) Feasibility (s)
16. NEGATIVE IMPACTS				
(a) Natural Resources	*Predict any significant reduction in the quality of air, water and soil or loss of biodiversity.*	Emphasise threats to the integrity of ecosystems that could affect economic or social sustainability.	Use predictive qualitative models where possible, to avoid vague predictions.	Prefeasibility (s) Feasibility (s) Design and Engineering (r)
(b) Human Resources	*Evaluate the risk of significant deterioration in the health or well-being of the affected people.*	Use the results of public consultation to focus the analysis on locally important concerns and issues.	Undertake an economic and social valuation of the predicted environmental impacts.	Prefeasibility (s) Feasibility (s) Design and Engineering (r)
(c) Relocation and Compensation	*Evaluate plans for involuntary relocation and describe measures taken to minimise the number of relocates.*	Assess the success of previous relocation programmes and recommend changes in current plans accordingly.	Evaluate the fairness and equity of criteria for determining compensation, and identify required changes.	Prefeasibility (s) Feasibility (s) Design and Engineering (r)
(d) Cumulative Impacts	*Evaluate the incremental contribution to the long-term degradation of local natural and social systems.*	Compare the severity of cumulative impacts with those from other previous development activities.	Review past trends and compare current quality indicators to estimated or perceived thresholds.	Prefeasibility (s) Feasibility (s) Design and Engineering (r)

Framework Terms of Reference for Environmental Assessment of Development Assistance Projects

TOPICS TO BE ADDRESSED	BASIC REQUIREMENTS	PROCEDURAL CONSIDERATIONS	OPERATIONAL CONSIDERATIONS	PROJECT STAGES
(e) Trans-Boundary Impacts	*Evaluate the potential for neighbouring countries to be impacted and the potential effects on the global commons.*	Identify the most likely sources of extra-territorial impacts and describe how such impacts will be kept to a minimum.	Focus on any far-field effects of pollution, and impacts on species or ecosystems of global importance.	Prefeasibility (s) Feasibility (s) Design and Engineering (r)
(f) Impact Significance	*Define the meaning of the term "significant" and assess the significance of the expected impacts.*	Where possible, determine thresholds that reflect local environmental and socio-economic values.	State the environmental quality standards to be applied in the assessment.	Prefeasibility (s) Feasibility (s)
H. MITIGATION AND MONITORING				
17. ENVIRONMENT MANAGEMENT PLAN	*Provide a detailed plan covering mitigation of predicted impacts, management of residual effects, relocation and compensation schemes, decommissioning, and training programmes.*	Allocate roles and responsibilities and show how the Management Plan is expected to influence project final design, operation and eventual decommissioning.	Present mitigation plans in sufficient detail that they can be incorporated into the criteria for project design, operation and shutdown.	Design and Engineering (r) Monitoring and Evaluation (r)
18. ENVIRONMENT MONITORING PLAN	*Provide a comprehensive and detailed plan covering the environmental and social variables to be monitored, the location and timing of sampling and the use to be made of monitoring data.*	Clearly state the institutions(s) responsible for the monitoring plan and how the resulting information will influence the operation of the project.	Provide sufficient guidance (and training where necessary) on sampling protocols and analytical standards to ensure the generation of reliable data.	Monitoring and Evaluation (r)
I. CONCLUSIONS AND RECOMMENDATIONS				
19. PROJECT DECISIONS	*Indicate the extent to which the proposed project conforms with the general principles of sustainable development.*	Show how the project has been modified to make it more sustainable and explain the shortcomings that remain.	Compare the proposed project with reasonable alternatives, in terms of benefits and environmental impacts	Feasibility (s)
20. TECHNICAL MATTERS	*Summarise the design and operational changes that are considered critical to improving the environmental acceptability of the project.*	Note any legal, policy, procedural or administrative impediments to achieving the required changes to the project.	Note any engineering constraints or risks to achieving the necessary technical changes.	Feasibility (s)
21. NON-TECHNICAL SUMMARY	*Summarise, in non-technical terms, the key findings and recommendations of the assessment, including the main economic benefits, significant environmental effects and proposed mitigation measures.*	Summarise any changes required to in-place management systems to ensure that the project is designed and operated in accordance with the recommendations of the environmental assessment.	Highlight the technical and procedural aspects of the assessment that pose the greatest risk to the successful completion and operation of the project, and the recommended strategies to circumvent these.	Feasibility (s)

Key
s - if stage occurs concurrently with assessment
r - influenced by results of assessment
i - information sources for the assessment

SCOPING METHODS AND BASELINE STUDIES IN EIA

G. Beanlands

In: Wathern, P. (1992) *Environmental Impact Assessment: Theory and Practice*, Unwin-Hyman. London pp. 33-46.

INTRODUCTION

Scoping and baseline studies are activities that are undertaken at early stages in an environmental impact assessment (EIA). It is difficult to overemphasize the importance of these activities since the success of an EIA will depend largely upon how well they are conducted. Scoping refers to the process of identifying, from a broad range of potential problems, a number of priority issues to be addressed by an EIA. In other words, it is an attempt to focus the assessment on a manageable number of important questions. Baseline studies, in turn, are designed to provide information on the issues and questions raised during the scoping exercise.

The importance attached to both scoping and baseline studies arises from the fact that environmental assessments are almost always conducted under serious limitations of time and resources. Any priority-setting activity, therefore, should improve efficiency and provide a more focused product for decision makers. In this paper, scoping and baseline studies are discussed mainly with respect to biological components. It should be stressed, however, that similar considerations relate equally to other environmental attributes.

SCOPING IN EIA

The term scoping has recently appeared on the environmental impact assessment scene as a result of the 1979 regulations under the US National Environmental Policy Act (NEPA) which require lead agencies to undertake "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (Council on Environmental Quality 1980). The agencies should achieve this objective through careful consideration of existing information relevant to the assessment as well as the organized involvement of other agencies and consultations with the general public.

This is a somewhat belated recognition of the need to establish clearly the focal point for an assessment at the outset; failure to do so severely limits the probability of obtaining useful and credible results. Scoping, in effect, provides a means whereby the public has a role in translating the policy wording of NEPA, that is, "restoring and maintaining environmental quality for the overall welfare and development of man", into a tangible specification for each individual impact assessment.

There is no sure way of anticipating the concerns of the general public, if for no other reason than that social values change with time. Although the results can verge on the philosophical, social scoping may help to define the concepts that become formal requirements for impact assessment. For example, consider the following quote from the US Atomic Energy Commission's (USAEC) Directorate of Regulatory Standards:

> "A species, whether animal or plant, is 'important'; (1) if it is commercially or recreationally valuable, (2) if it is rare or endangered, or (3) if it affects the well-being of some important species within criteria (1) or (2) above, or (4) if it is critical to the structure and function of the ecological system." *(USAEC 1973)*

As Eberhardt (1976) noted, it is virtually impossible to translate phrases like 'well-being' into an operational focus for a study. In addition, in most cases the structure and function of natural systems are not understood, so that it would not be possible to determine the critical nature of various components.

With respect to biological components of the environment, social scoping, to be useful as an operational guide, is often expressed as the plant or animal species perceived by society to be important. Thus, among other more ecological criteria, Cairns (1975) used commercial, recreational and aesthetic values as some of the bases for establishing a list of critical species. Similarly, Truett (1978) established the focus for a major impact research programme on 'key species' which were defined on the basis of abundance, as well as their commercial, recreational and food value to man. He considered that there was:

> good reason for concentrating research on species considered to be of immediate value to society. The reason relates both to the difficulty of assigning environmental value to species not useful to man and to the fact that species with little value are of little concern to decision-makers. And, lest we forget, the ultimate purpose of an assessment study is to influence decision.

Two publications which provide the most detailed technical direction to those undertaking impact assessment (States et al. 1978, Fritz et al. 1980) have both treated social and economic values as major factors in narrowing the range of ecosystem components which should be considered. Thus, in summary, scoping might be defined as a "very early exercise in an EIA in which an attempt is made to identify the attributes of components of the environment for which there is public (including professional) concern and upon which the EIA should be focused" (Beanlands & Duinker, 1983).

THE QUESTION OF SIGNIFICANCE

In some respects, adopting a definition for significant impact represents an initial attempt to reduce the scope of assessment studies to the most important consideration of the significance of environmental effects. Any consideration of the significance of environmental effects must acknowledge that environmental impact assessment is inherently an anthropocentric concept. It is centred on the effects of human activities and ultimately involves a value judgement by society concerning the significance or importance of these effects. Such judgements, often based on social and economic criteria, reflect the political reality of impact assessment in which significance is translated into public acceptability and desirability.

In this context, the ecological implications of a proposed development usually get translated into effects on physical and biotic resources valued by man for commercial, recreational or aesthetic purposes. From the perspective of an ecologist, more profound changes to the intrinsic structure and function of natural systems may be involved, but their significance probably will be evaluated by the public in terms of the implications for such resources. In effect, ecologists involved in environmental impact assessment are often required to extend their interpretation of impacts beyond the limits of professional interest and to emphasize those environmental attributes perceived by society to be important.

While the detailed results of a scoping will depend upon the specific nature of the project under consideration, a number of themes seem to recur. The primary concern of the public with respect to environmental matters is human health and safety. All others will be subordinate when man's health is in jeopardy as a result of a proposed development. The public will have a great concern for potential losses of important commercial species or commercially available production. The converse would hold true regarding an increase in the numbers of undesirable species. Society can be expected to place a high priority on species of major recreational or aesthetic importance, whether or not they support commercial activities of any consequence. Special interest groups will usually gain broad support in their concern for rare or endangered species on the basis that mankind has special custodial responsibilities regarding their preservation. Finally, the public can normally be expected to be concerned over habitat losses which represent a foreclosure on future production. In all of these cases, public concern will be heightened in relation to perceived imbalances between supply and demand of species or habitats within a local, regional, or national context.

This approach was adopted in the assessment report for the South Davis Strait offshore exploration programme in Canada (Imperial Oil Ltd. *et al.* 1978) where significance was taken to include reductions in populations of species of subsistence or commercial importance to local users. Likewise, a company representative indicated the regular use of a simple scoping exercise to focus the assessment study effort. This included four categories of species: commercially important, important as indicators, ecologically important, and species high in the trophic structure. Some attempt was made to include a few species from each category in the impact assessment studies.

There is growing concern about the need for social scoping very early in the assessment process. Recent hearings to discuss the draft assessment guidelines for the Beaufort Sea hydrocarbon production proposal in Canada can be considered as a scoping exercise. It is not apparent, however, from the final guidelines (Beaufort Sea Environmental Assessment Panel 1982) that the exercise was entirely successful. The document directs the proponents to discuss the biological environment ranging from micro-organisms to mammals. While later sections suggest that studies should be limited to effects "that are deemed to be significant", it is only at the end of an appendix to the guidelines that the true meaning of this becomes apparent. Significance is defined as affecting "species that at present are of direct value to society such as those that may be considered rare or endangered or important for subsistence, scientific, commercial or recreation value".

SOCIAL SCOPING AND SCIENTIFIC ENQUIRY

The compromise struck between the subjectivity of value judgements and the objectivity of the scientific approach is largely a function of the relative importance of the role of science at various stages in the sequence of impact assessment activities (Fig. 2.1). There seems to be a consensus that initially some direction, explicit or implied, must be given to the scientific pursuits. The logic sequence in providing such direction is considered to involve impacts perceived to be: socially important, socio-political decisions required, technical questions posed, and scientific answers attempted. Thus, the

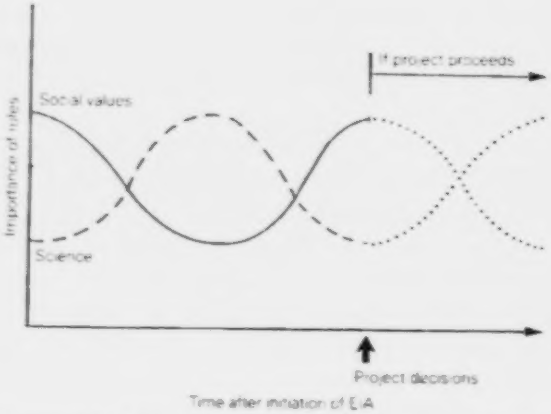


Figure 2.1 Changes in the relative importance of science and social values in EIA.

initial major role of value judgements in establishing a focus for the assessment is gradually replaced with a scientific programme of investigations to address the social concerns.

This translation of social concerns into scientific investigations is fraught with moral, conceptual and operational difficulties for many scientists. It is not surprising that dedicated scientists feel professionally constrained when they are expected to focus their expertise solely on social concerns which often change with time. Furthermore, it is often difficult to conceptualize scientifically the public's perception of an environmental problem; impacts on attributes of aesthetic value are a prime example.

Eventually, the pre-project scientific studies must be concluded and the results presented to those responsible for making project-related decisions. At this stage in the process, the importance of social value judgements may outweigh scientific considerations. Although the implications can be frustrating to scientists involved in environmental impact assessment, the fact remains that project decisions will reflect some compromise between social aspirations and the results of scientific enquiry.

In theory, the role of the scientist will once again dominate in the design and implementation of post-EIS monitoring programmes. The same range of problems is posed as in pre-project studies. However, there is greater opportunity to apply a quantitative approach in measuring changes than in predicting them.

SCOPING METHODS

Determining the priority values of society with respect to the potential effects of a particular development proposal is a major concern. There are various issues which are of concern irrespective of the approach to scoping which is adopted. First, it is extremely important to define clearly the segment of "society" involved, that is, the target population. Once identified, the target population must be given adequate information about the project and the potential environmental effects in a format which they can understand. In addition, the target population must be given enough time to organize its thoughts and ideas regarding the potential environmental problems. Finally, the mechanism whereby the target population is able to voice its concerns to the decision makers must be clearly understood. Meeting these requirements entails advanced planning, the involvement of competent staff and access to adequate resources.

There are various direct and indirect ways of conducting a scoping exercise. Regardless of which approach is used, however, it always should occur very early in the EIA process. Under NEPA regulations the sponsoring federal agency is required to have meetings involving all parties directly affected or interested in the proposed project. At these sessions, the participants are encouraged to present their concerns about the project and an attempt is made to define the priorities in these perceived problems.

A similar approach based upon public meetings has been used recently under the Canadian Federal Environmental Assessment Review Process (EARP). In this case, prior to formal EIA hearings, smaller community-based meetings are held at which local residents and other interested parties are given the opportunity to discuss their concerns in the presence of the assessment panel and representatives of the industrial proponent. Also in attendance are spokespersons for government agencies and research establishments who also make representations to the panel. All of this interchange takes place in a nonadversarial forum in which the participants do not have to defend their concerns. Ideally, the sessions should lead to increased understanding about the potential environmental effects and clarify the issues perceived by the community at large.

The Canadian scoping sessions are preceded by the distribution of written material on the project as well as small informal sessions where people are encouraged to "drop in" and learn more about the project. In one case, the scoping programme for a proposed nuclear power plant, a scientific advisory group was also formed which added to the development of priority concerns from a technical perspective. In complex projects, this scientific contribution may be an important aspect of the overall scoping process since many of the potential impacts may be beyond the understanding of the general public.

The advantage of the scoping meeting is that it affords an opportunity for an open dialogue between those responsible for the EIA and the public whose interests they are supposed to represent. Such open discussions can often lead to a resolution of perceived problems which are based upon misunderstandings. The disadvantages are that it is time-consuming, requires financial and manpower resources and needs the full co-operation of the industrial proponent.

If it is not possible to hold scoping meetings, questionnaires or surveys may be used to assess public concern. This indirect approach to scoping is less desirable for a variety of reasons. First, the return rate on surveys is normally quite low and it may be biased towards the more vocal segments of the community. Secondly, proper survey design requires experts in the field who may not be available at the time required. Third, the analysis and interpretation of survey results are subject to professional disagreement which may further confuse the issues rather than clarifying them.

When dealing with isolated or reasonably well-defined target populations, it may be possible to assist the community itself to conduct its own scoping programme. By providing financial support or organizational skills, those responsible for conducting an EIA may be able to encourage local people to use existing communication mechanisms to determine community concerns. Where this can be done, it is highly recommended since it increases the credibility of the resulting advice to government and proponents.

In the normal sequence of events a scoping exercise, by whatever method, would provide a list of priority concerns. These, in turn, would be incorporated into guidelines for the preparation of an environmental impact statement (EIS). Depending upon the nature of the priority issues identified, the baseline study programme undertaken as part of the EIS should be structured around the results of the scoping exercise. Thus, the scoping programme may have a major influence on the focus of the entire EIA and, therefore, upon the advice given to decision makers.

BASELINE STUDIES IN EIA

Baseline studies are perhaps the most commonly recognized, and yet least understood, element of EIA. The term usually refers to the collection of background information on the environmental and socioeconomic setting for a proposed development project and it is normally one of the first activities undertaken in an EIA. From the above discussion it can be seen that a baseline studies programme may be designed around the results of a scoping exercise. Whether it involves the collation of existing information or requires the acquisition of new data through field sampling, baseline studies frequently account for a large part of the overall cost of an EIA.

Environmental impact assessments are often conducted under severe time restrictions and, since it is relatively easy to collect information and data, there is a tendency to give too much emphasis to baseline studies early in the assessment process. The result is that there is often a great deal of information made available on the environmental setting of a particular project, but it may be irrelevant to the resolution of certain critical questions raised at later stages in the EIA.

There is an almost universal problem with baseline studies as applied in EIA; that is, they are undertaken without clearly defined objectives. Seldom is there an understanding of why data are being collected or to what problem they will be applied. In order to cover all potential requirements an effort is made to gather some information on all aspects of the environment. This inevitably leads to superficial surveys which provide only reconnaissance-level information. In the end, much of the investment in time and resources is wasted.

Perhaps the most glaring inadequacy of many baseline studies is that they do not reflect the ultimate needs of the decision maker involved in project planning. During the planning of development projects there are key decision points for which important environmental and socioeconomic data should be available from baseline studies. If these critical stages and the related information needs are not clearly defined at the beginning of an EIA, it is unlikely that the prime needs of the decision maker will be met.

A DEFINITION FOR BASELINE STUDIES

The term 'baseline studies' entered the environmental literature about the same time as the concept of EIA, about 15 years ago. Although the phrase does not appear in the wording of NEPA it quickly became standard terminology in EISs prepared under that legislation.

There does not appear to be any universally accepted definition for environmental baseline studies. Walsh (1983), in a major dissertation on the subject, records more than 15 formal written definitions of the term. In general, it is taken to refer to a description of some aspects of the physical, biological and social environments which could be affected by the development project under consideration.

It is this vague definition which causes most difficulties with baseline studies. An attempt is made to describe "the environment" and this usually means accumulating any information which is available on the general topics of land, water, air and people. The focus is often on information and data which are readily available rather than on what is needed.

A more operative definition is given by Hirsch (1980) who defines a baseline study as a "description of conditions existing at a point in time against which subsequent changes can be detected through monitoring". Using the same approach, a group of research scientists reviewing assessment requirements in the offshore marine environment suggested that baseline studies be designed "to provide insight into the normal variability of phenomena such that appropriate monitoring programs can be designed" (Anon. 1975). From these definitions it can be seen that baseline studies are closely linked to environmental monitoring. In other words, if the practical objective of EIA is to predict changes in the environmental and social systems resulting from a proposed project, baseline studies provide the before-project records whilst monitoring gives the after-project measurements from which changes over space and time can be assessed.

An example may help to stress the operational implications of this definition. Suppose that a coal-fired thermal electric generating plant is to be constructed and there are concerns about the effects on air and water quality, namely increased levels of sulphur dioxide ($S0_2$) and raised water temperatures resulting from the discharge of cooling water. If there are other industries in the area it is likely that local $S0_2$ concentrations are already elevated above 'normal' levels and there will be daily and seasonal variations. It is also probable that the water body scheduled to receive the cooling water is already under stress from other industrial sources and its quality and temperature will vary, particularly on a seasonal basis.

In this case, the objective of baseline studies would be to determine the existing levels of $S0_2$ in the atmosphere in the vicinity of the proposed plant and hourly, daily and monthly variations in the levels. Baseline studies on the aquatic environment would determine the existing species composition, levels of pollutants and the normal water temperature changes throughout the season.

Once these background values were determined for the area in question, they could be compared with the predicted $S0_2$ emissions and the expected water temperature changes as a result of the cooling water discharge. If the expected changes were considered acceptable (that is, within prescribed standards) and the plant constructed, the actual changes from baseline conditions would be determined through monitoring. Operational procedures at the plant could be altered if the actual environmental changes were greater than anticipated.

THE ROLE OF BASELINE STUDIES IN EIA

Beanlands & Duinker (1983) envisage EIA as a series of basic, sequential steps, Figure 2.2a. Thus, an initial baseline data collection programme would be used to characterize the pre-project state. Cause and effect studies would then be undertaken to predict how stated variables would change as a result of projected activities. Subsequently, following start-up of the approved project, monitoring would be used to determine actual impact conditions.

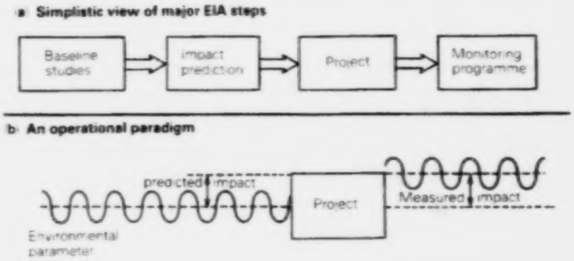


Figure 2.2 EIA showing: (a) the basic steps, and (b) processes translated into the roles of baseline studies and monitoring.

These simple steps can be translated into a diagram which clearly shows the relationship between baseline studies and monitoring (Fig. 2.2b). Thus, baseline studies would be directed towards establishing statistically valid descriptions of selected environmental components prior to the onset of the project under consideration. Subsequently, an effort is made to predict the extent to which the values would change as a result of the project. The project may or may not proceed, in its original or altered form, depending upon the reliability and acceptability of the predicted changes. In the event that the project proceeded, baseline variables would be remeasured during project construction and operation to determine the extent to which the predicted changes had occurred. In Figure 2.2b it is important to note the continuity of selected variables from baseline studies through to the monitoring programme.

The above description adequately portrays the role of baseline studies in EIA in a technical sense. However, EIA is fundamentally a planning tool. It should be undertaken to provide environmental and social input into the project decision-making process. In this context baseline studies must do more than provide a statistically valid description of specified environmental components prior to project initiation. They must be linked to critical decision points throughout all phases of project planning. The details of this will become clear in the following section; however, it is important to realize that baseline studies have a key role to play from the inception of a project through to final design and the setting of operational standards. A concentrated effort on baseline studies at the beginning of an EIA fails to optimize the potential use of such information in other stages of the development process.

Of course, one of the prerequisites for such use of baseline studies is a strong working relationship between the project planning team and the people responsible for the EIA. Although this seems to be logical, in reality, many EIAs are considered to be extraneous to the planning process and those responsible for conducting EIA studies, including baseline studies, are not given proper direction as to the environmental information required. The remainder of this chapter will show how better communication and understanding on both sides could greatly enhance the timing and usefulness of environmental information arising from baseline studies.

BASELINE STUDIES AND PROJECT PLANNING

It often appears that environmental impact assessments are undertaken on the assumption that there is only one major project decision, that is, a single point in time when the results of the environmental assessment are considered by those responsible for project planning. This perception is enforced by the environmental impact assessment process itself which culminates in the tabling of an assessment report or EIS. The implication is that the concerns presented in an assessment could not have been taken into account at earlier stages in the project planning cycle. Unfortunately, in most cases, by this time the major elements of a project have been decided, such as need, site and design criteria. Under such circumstances, baseline studies amount to little more than an attempt to rationalize decisions which have already been taken.

As pointed out by McMichael (1975), the reality in project planning is that there is a multitude of decision points shared among various agencies in the public and private sectors. The sequence of decisions is not always recognizable or predictable and many of the decisions are retractable. This decision-making network, spread out in time and among various interested parties, is even more complex when it involves international aid projects since another level of bureaucracy and decision making is added.

Baseline studies must be designed with these realities in mind if they are to be an effective means of bringing the environmental perspective to bear on industrial development. Specific information and data are required by different decision makers at various stages in the project cycle which should be accommodated within the concept and practice of baseline studies.

The project decision network.

In a very generalized sense, there are four critical stages in the sequence of project-related decisions, with different responsibilities assigned for each. These are shown in Table 2.1. The nature and extent of baseline information required at each of these decision points is quite different, yet equally important from an environmental perspective. Thus, in taking the initial project approval step, the proponent would need information on environmental legislation and policies which could seriously affect the economic viability of the project. If the decision is made to proceed with the project, the choice of a site may reflect concerns over various environmental sensitivities such as endangered species or resource use conflicts, some of which may be directly linked to the resource management responsibilities of government agencies. In considering the design and operation of a project, the proponent needs specific information on the resources potentially at risk at the selected site and on the relationship between projected effects and standards set by regulations or public acceptability.

In reality, these decisions would not be taken in the simplified sequence suggested above. Nevertheless, the point is that the information needs are quite different at various stages in the planning process. It should also be clear that limited information on the biological and physical characteristics of a development site will not ensure an adequate consideration of environmental concerns in the development planning process.

BASELINE STUDIES FOR A HYDROELECTRIC DEVELOPMENT

In parts of Labrador in eastern Canada there are major rivers which have potential for hydroelectric development. The most promising of these is the Eagle River where preliminary investigations have suggested the possibility of a 600 MW development. This example will be used to demonstrate how important it is to have environmental baseline studies phased in with the major stages in project decision making. For reasons of brevity, the focus will be on a rather narrow set of environmental concerns. However, the principles demonstrated by the example are equally valid for a broad range of environmental concerns.

Table 2.1 Critical decision stages in project planning and associated responsibilities.

Decision	Responsibilities
1 A primary decision on whether the project will be undertaken - an 'approval in principle'	Ostensibly the decision is taken by the project proponent based on economic criteria; actually governments often decide indirectly through the provision of incentive grants, loan guarantees, licences, permits, etc.
2 A decision on where the project will be built—sometimes within a national or regional context.	Normally the responsibility of the proponent, but often greatly influenced by government policies respecting political, economic and social development strategies.
3 A decision on how the project is to be built—a consideration of basic design options.	Proponent's responsibility, but influenced by standards and limits set by government agencies through legislation or policies.
4 A decision on how the project will be operated—to some extent this depends on the degree of flexibility inherent in the design.	

Should the project be approved in principle?

For this proposed development, one of the major environmental concerns is the possible effects of the dam on populations of the Atlantic salmon (*Salmo salar*) for which the Eagle River is a major spawning area. There are various reasons why effects on salmon would be a key factor at this initial decision stage. First, salmon populations throughout eastern Canada are depressed compared with historical levels and the long-term viability of the species is in question. This concern is widespread amongst resource managers, fishermen, and the general public. Secondly, salmon is a valuable species for both recreational and commercial fisheries. For example, it is known that the commercial catch along the Labrador coast makes up about one-third of the total provincial catch. Thirdly, anadromous species, such as salmon, are sensitive to hydroelectric developments and over the years many of the best salmon spawning rivers have been lost due to dam construction. Finally, the management of salmon stocks is a responsibility of the federal government and the proponent could not proceed with the project without a permit issued under the Fisheries Act.

Environmental baseline studies at this stage should be directed towards determining whether it is possible to proceed with the project and meet the requirements of the Fisheries Act. An important consideration is the intention of the federal government to adopt a policy preventing any net loss of salmonid habitat resulting from hydroelectric developments.

Three specific studies would have to be undertaken. First, it would be necessary to determine what percentage of the Labrador coastal fishery is dependent upon production from the Eagle River. A review of historical catch records and recent population surveys conducted by government agencies, along with a limited tagging programme, would provide an approximate answer. Secondly, a study would be required to determine the feasibility of building and operating a salmon hatchery in the area of sufficient size to replace the maximum possible loss of production from the project. Finally, a reconnaissance survey of nearby salmon-producing rivers (of which there are three) could indicate the potential for opening up salmon habitat which is currently inaccessible due to physical obstructions. This information could provide some idea of the possibility of meeting the requirements of the policy regarding no net loss of habitat and its financial implications. The information provided by these studies would be crucial in deciding whether the measures necessary to meet the requirements of the Fisheries Act were of such a magnitude as to affect the economic viability of the project. The most significant point is that such studies would be required before a commitment in principle to the project.

Where should the project be built?

Depending in part on the results of the first baseline studies, the proponents might attempt to negotiate an agreement in principle with the fishery management agency on the basis that they could meet the requirements of the Fisheries Act. If such efforts were successful, the next major decision to be addressed would be the location of the dam(s) on the river. In reality, the proponent already would have conducted engineering feasibility studies which would have identified priorities from a list of potential sites. In this case, the proponent had looked at eleven potential sites and had decided that three were economically viable, with a combined potential output of 600 MW. At this stage, more detailed and focused baseline studies would have to be conducted with the objective of assessing: the percentage of the total Eagle River salmon population which would be prevented from reaching their spawning habitat under the proposed dam regime; the distribution of currently available salmon habitat of various classes within the entire Eagle River system; the extent of habitat of various classes throughout the drainage area currently unavailable to salmon and the nature of the blockage; and the losses of habitat of various classes and how much could be made accessible above each of the preferred dam sites. This information would be necessary in deciding the potential trade-offs between the engineering costs associated with different dam sites and the financial implications of maintaining salmon populations and of reducing the loss of spawning habitat. It could be that some of the other eight original sites surveyed would be reconsidered. In any event, the results of the baseline studies undertaken at this site-selection stage would influence the benefit:cost ratio of the project and further define the best strategy to pursue with respect to the construction of a fish hatchery and development of new spawning habitat.

How should the project be designed?

In spite of the environmental planning implications arising from the two previous stages in the decision-making process, this is the stage at which conventional baseline studies are undertaken. In most cases the economic viability of the project has been determined, and the site chosen, before baseline studies are undertaken as the first step in the environmental impact assessment process.

Unfortunately, at this stage in the project planning cycle there are only a few options available for mitigating environmental problems. Information would be required on the maximum and minimum downstream water flows necessary to protect migrating adult fish as well as the viability of juvenile stages. The dam design would have to take into account the water flows required at various times throughout the year. This could mean that all of the dams in the system have to be regulated in a co-ordinated manner to maintain the required water flows in the lower reaches of the river, particularly in the estuary. Normally, by this stage, the hydrological regime is well understood, although it is likely that the biological parameters are less well defined, particularly since different rivers have their own salmon production characteristics.

Another important consideration would be whether a fish ladder should be incorporated into the design of the dam. If the production and habitat studies showed only limited projected losses, the proponent may be able to argue effectively for a less expensive programme to net the adults and move them above the dam by truck or other such means.

How should the project be operated?

Studies at this stage in the project cycle would be directed towards establishing monitoring and operational feedback systems to ensure that the design features built into the project are properly implemented. A number of objectives could be established. These include, for example, determining the long-term survival of salmon moving past the dams; establishing the survival rate above the dams compared with that in unaffected parts of the river; assessing whether newly developed habitat is being used to the extent predicted; and the relationship between salmon production in the river and commercial salmon catches.

Most would be continuations of studies initiated during previous decision stages. In effect, environmental monitoring during the operational phase of a project is a continuation of pre-construction baseline studies. The overall objective is to ensure that the project is operated in accordance with its design specifications and to determine whether the mitigation measures applied were as effective in protecting the resource base as predicted.

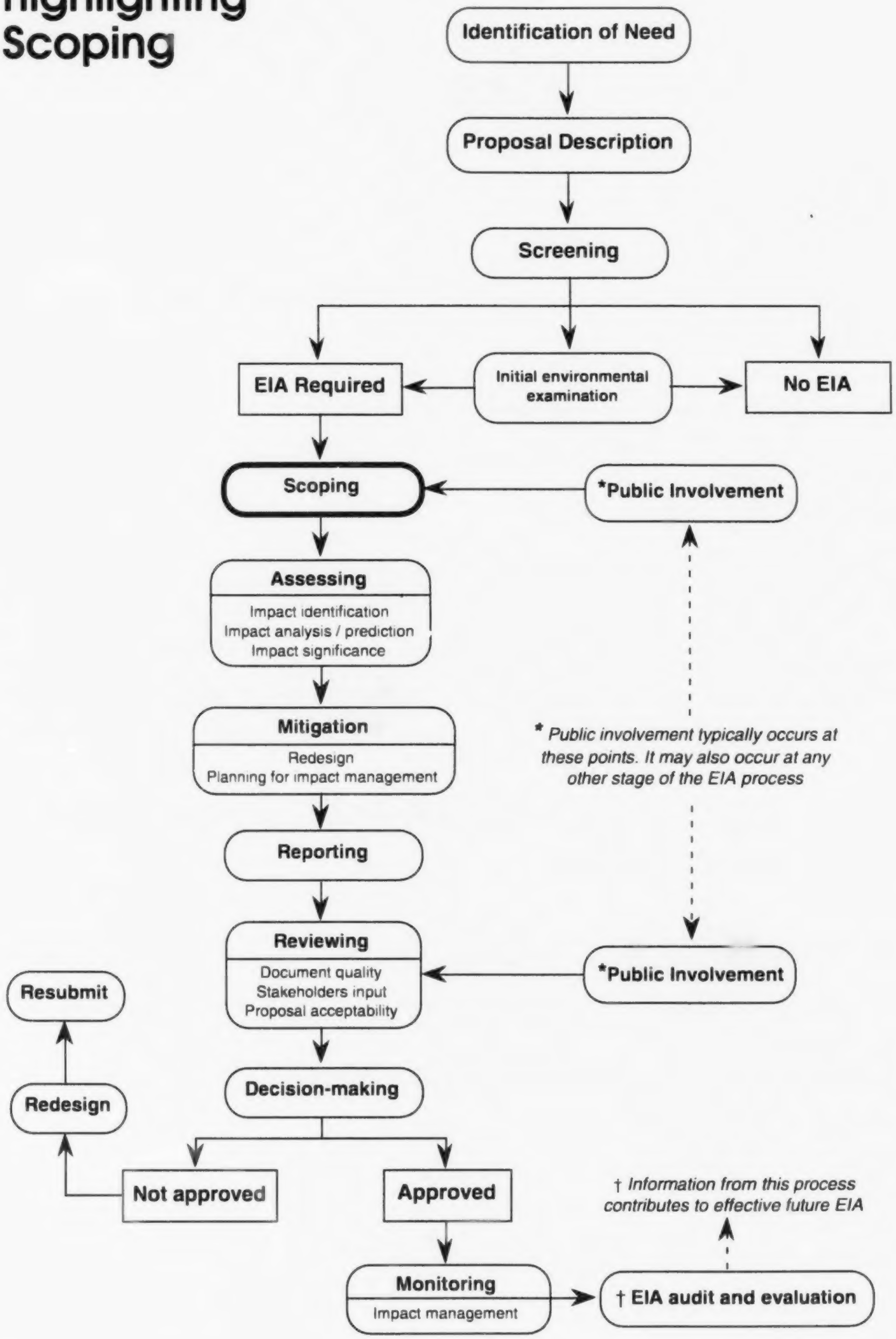
CONCLUSION

Three basic themes have been pursued in this article. First, environmental baseline studies as conducted in the past have been only marginally effective in influencing key project decisions. Normally, they are undertaken at a stage in the project planning cycle when important opportunities for mitigation are no longer available.

Secondly, the concept of baseline studies as a statistical characterization of the state of the physical and biological environments is far too limited. It must be broadened to include information of a strategic nature, useful in early project decisions with respect to approval in principle and the choice of site.

Finally, no single, key, project decision point exists. A broader definition of baseline studies is needed so that such studies can be integrated with the multitude of decisions and decision makers which represents the real world of project planning.

Flow chart highlighting Scoping



Identification of Need

Proposal Description

Screening

EIA Required

Initial environmental examination

No EIA

Scoping

*Public Involvement

Assessing
- Impact identification
- Impact analysis / prediction
- Impact significance

Mitigation
- Redesign
- Planning for impact management

** Public involvement typically occurs at these points. It may also occur at any other stage of the EIA process*

Reporting

Reviewing
- Document quality
- Stakeholders input
- Proposal acceptability

*Public Involvement

Resubmit

Redesign

Decision-making

Not approved

Approved

† Information from this process contributes to effective future EIA

Monitoring
- Impact management

† EIA audit and evaluation

Scoping:

- is a process of interaction
- identifies
  - boundaries of the EIA study
  - important issues of concern
  - the necessary information for decision-making
  - significant effects and factors to be considered
- identifies concerns, evaluates them, organises and presents them to assist analysis and decision making

The purpose of scoping in EIA

- consider reasonable and practical alternatives
- inform potentially affected people
- identify the possible effects
- understand local values
- evaluate concerns expressed
- define the boundaries of the EIA study
- determine analytical methods and consultation procedures
- establish procedures for consultation and analysis
- establish the Terms of Reference

Steps in the scoping process

1. Prepare an outline of the scope
2. Develop the outline through informal discussion
3. Make the outline widely available
4. Identify issues of concern
5. Evaluate the concerns
6. Amend the outline to incorporate the concerns
7. Develop a strategy for addressing the key issues
8. Provide feedback to participants

Who should be involved in scoping?

- the proponent
- the administering agency
- other agencies
- environmental practitioners and experts
- those affected
- the wider community

Investigating alternatives

- demand alternatives
- activity alternatives
- location alternatives
- process alternatives
- scheduling alternatives
- input alternatives

Outline of a Terms of Reference

- background to the proposal
- setting the context for the problem
- alternatives
- institution and public involvement
- required information
- analysis of impacts
- mitigation and monitoring
- conclusions and recommendations
- requirements for managing the EIA

Topic 6—Assessing

Objective

To provide course participants with an overview of the variety of impact identification methodologies and their strengths and weaknesses as tools for identifying different impacts and their sources/causes.

Relevance

A range of impact assessment methodologies have been developed to aid the systematic identification of impacts requiring detailed analysis and investigation.

Those involved in EIA need an understanding of 'how' and 'when' each methodology is appropriate to use as a tool for identifying impacts and their causes.

Timing

Four hours (not including training activity)

☑ Information checklist

Obtain or develop the following, as appropriate:

- ☐ a resource bank of locally appropriate, sector specific impact identification methods (eg checklists, matrices, overlays etc) and examples of these methods as used in actual proposals;
- ☐ examples of the different types of impacts that have been identified in local projects, in particular impacts that are peculiar to the region;
- ☐ examples of impact analysis techniques that can be used (eg to assess social impact, air quality, noise etc);
- ☐ examples of techniques used for making judgements about impact significance;
- ☐ examples of EIAs in which a range of alternatives were examined identifying, where possible, the method that was used to choose between them;
- ☐ copies of any research focused on the use of impact identification methods, impact analysis techniques and assessing impact significance;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres able to provide assistance in relation to impact assessment; and
- ☐ other resources that may be available such as courses in specific analytical or methodological techniques, videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why they are important.

This topic is structured to reflect the next three stages of the EIA process:

- identifying and defining more specifically the impacts that are to be investigated in detail;
- analysing impacts: the collection of baseline data, the important characteristics of impacts and the range of different analytical techniques; and
- determining impact significance or acceptability.

Review the screening and scoping phases of the EIA process linking them to the impact assessment stage of the process. (Refer as necessary to Topics 4 and 5 for information on screening and scoping).

The screening phase of the EIA determines whether or not an EIA is required for a particular proposal and the scoping phase identifies the issues that are the most important to investigate in detail (making sure that money is not wasted investigating issues that are not of concern).

The 'assessing' phase of EIA, the focus of this topic, is the time when most of the work involved in impact assessment is carried out. Assessing usually involves three main tasks:

1

- further and more detailed work on impact identification refining the understanding of the nature of the impacts, identifying indirect, cumulative and other impacts and ensuring identification of the likely causes of the impacts;
- detailed analysis of the impacts to determine their nature, magnitude, extent and effect; and
- judgement of the significance of the impacts (whether they matter and whether something needs to be done to mitigate them).

Outline how the move towards sustainability has widened the range of impacts that are usually considered during impact assessment beyond those that are purely bio-physical.[1] Provide brief examples of the range of impacts that are currently considered in EIA of local proposals

---

In the early years of EIA, environmental impacts were considered to be impacts on the natural, biophysical environment (such as effects on air and water quality, flora and fauna, noise levels, climate and hydrological systems). However, the focus on biophysical impacts alone did not last long. The institutionalisation of EIA, with its public disclosure and consultation processes, seemed to act as a magnet to individuals, groups and agencies who wanted other kinds of impacts to be incorporated in decisions. They were assisted to some extent by the evolving definition of the term 'environment' which has increasingly broadened to incorporate social and other aspects. In 1994, the Development Assistance Committee of the OECD defined 'environment' for the purposes of EIA to include:

2

- effects on human health, well-being, environmental media, ecosystems and agriculture;
- effects on climate and the atmosphere;
- use of natural resources (regenerative and mineral);
- utilisation and disposal of residues and wastes; and
- resettlement, archaeological sites, landscape, monuments and social consequences as well as upstream, downstream and transboundary effects.[2]

Therefore, since the mid 1970s, additional types of impacts have been identified as requiring analysis and evaluation prior to their consideration in decision-making. The scope of EIAs has widened to incorporate social, health, economic and other issues.

However, it should be stressed that despite the general tendency to move towards this approach, the trend has not been universal. One alternative approach has been to supplement EIAs with related, but separate, specific studies (and reports) on non-biophysical impacts when they are considered to be particularly important for decision-makers.

Impact identification

Outline the need for a systematic and reproducible method of identifying impacts and their causes. Introduce impact identification methods and go on to discuss each of them in detail.

A logical and systematic approach needs to be used to refine the list of impacts that require detailed investigation and to ensure that all likely causes of impacts and the interactions between them are identified. While many people undertake these tasks using an ad hoc approach on a case by case basis, experience has shown that EIAs managed in this way often become unstructured and undisciplined and frequently fail to identify all of the significant impacts. They also tend to result in lengthy, descriptive collections of information that do not provide a suitable basis for decision-making.

Over time, a number of formalised EIA methodologies or aids have been developed to improve the effectiveness and efficiency of identification of impacts (some of them are also useful tools for presenting the results of the impact assessment or assigning significance, as discussed later in this topic). These methodologies have been based on the collective experience of a wide range of people and their use helps to streamline the EIA process and avoid many of the errors made in earlier EIAs. Many of these EIA methodologies have also been tailored for use in specific sectors thereby increasing the efficiency and accuracy of the impact identification process even further.

3

The most common formal methods used for impact identification are:
- checklists
- matrices
- networks
- overlays and geographic information systems (GIS)
- expert systems
- professional experience

Checklists

4

Checklists are usually developed from lists of environmental features or activities that should be investigated for possible impacts. They can vary in complexity and purpose from a very simple list through to a system that also assigns significance through the scaling and weighting of impacts (such as used in the Battelle system). Checklists can be improved and adapted to suit local conditions as experience with their use is gained. They can also be developed to be specific to generic sectors (such as dams or road building). Sectoral checklists are often useful when proponents specialise in one particular area of development.

Checklists are not effective in identifying higher order impacts or the inter-relationships between impacts and therefore, when used, care must be taken to consider whether impacts other than those listed may be important.

6–1 to 6–16

A series of sector-based checklists can be found in handouts for this topic.

Matrices

5

Matrices are grid-like tables that can be used to identify the interaction between project activities and environmental characteristics. Using the table, an interaction between an activity and an environmental characteristic can be noted in the cell that is common to both in the grid. 'Comments' can be made in the cells to highlight impact severity or other features related to the nature of the impact, for instance:

6–17 to 6–20

- ticks or symbols can identify impact type (such as direct, indirect, cumulative) pictorially;
- numbers or a range of dot sizes can indicate scale; or
- descriptive comments can be made.

The best known interaction matrix is that developed by Leopold et al. This comprehensive matrix has 88 environmental characteristics along the top of the table and 100 project actions in the left hand column and is suitable for use in most construction projects. The general approach taken by the Leopold matrix has been widely adapted and used to develop other matrices. Examples of Leopold-type matrices can be found in handouts 6–17 to 6–20).

Networks

6

Networks illustrate the multiple links between project activities and environmental characteristics and are therefore useful in identifying and depicting second-order impacts (indirect, synergistic etc). Simplified networks, used in conjunction with other methods, are useful in helping

6–21

ensure that major second-order impacts have not been omitted from the investigations. More detailed networks can be time-consuming and difficult to produce unless a computer programme is used for the task. An example of an impact network can be found at Handout 6–21.

Overlays and geographic information systems

Map overlays or computer images can be used to display impacts pictorially. The original, and relatively simplistic, overlay technique was developed by McHarg who mapped data onto transparencies so that they could be superimposed to gain an overall visual impression of the concentration of impacts. This system was somewhat limited in its application.

A more modern version of the method is the computer data-based geographical information system or GIS. GIS systems divide a map of an area into cells and for each cell they store a large range of information. This can be used for analysis and computer modelling purposes. The greatest disadvantage with GIS systems at present is the lack of appropriate data and the expense involved in putting it into a GIS system. As GIS systems become more common place these problems will be resolved.

GIS systems will be a powerful tool in the future identification and management of cumulative impacts.

Computer expert systems

An expert system is a computerised knowledge-based decision-making system. The user is systematically presented with questions that have been developed from existing knowledge of the system and the interrelationships being investigated. The expert system reviews the answer given to each question and moves to the next question as appropriate given the response.

Like GIS systems, expert systems are particularly information-intensive methods of analysis. They also have the potential to be very powerful in the future because they logically and systematically build upon experience over time.

Professional experience

Although not strictly a formal method, many professionals use the knowledge and expertise they gain in their work to systematically develop data-banks and technical aids that can be used to assist in future projects.

Review the factors that should be considered when choosing an impact identification method and outline how the choice could be made in a given situation.

No single impact identification methodology is necessarily the best to use on all occasions nor is it necessary to be restricted to using only one method at a time. It is often found that combining the useful aspects of two different techniques may be the best approach to take.

It should also be remembered that some of the methods also undertake other functions that may be useful to the EIA team (eg. the Battelle checklist system can be used to determine significance through the scaling and weighting of impacts).

7 The choice of methodology can depend upon a number of factors including:

- the type and size of the proposal;
- the type of alternatives also being assessed;
- the nature of the likely impacts;
- the nature and appropriateness of the impact identification method (see the table below);
- the experience of the EIA team with the impact identification method;
- the resources available — cost, information, time, personnel;
- the nature of the public involvement in the process;
- experience of the proponent with the project type and size; and
- any procedural/administrative requirements or constraints.

A word of warning

If you use impact identification methods (aids such as checklists or matrices) developed by others for their own purposes, care should be taken to ensure that these are suitable for your specific situation. In particular, care should be taken to make sure that any extreme environmental features peculiar to the region in which the project is proposed are adequately catered for (eg. flood, drought, temperature, seismic activity, land instability, disease vectors etc).

8 **Main Advantages and Disadvantages of Impact Identification Methods**

	ADVANTAGES	DISADVANTAGES
Checklists -simple	• simple to understand and use	• do not distinguish between direct and indirect impacts
-ranking and weighting	• good for site selection and priority setting	• do not link action and impact • the process of incorporating values can be controversial
Matrices	• link action to impact • good method for displaying EIA results	• difficult to distinguish direct and indirect impacts • significant potential for double-counting of impacts
Networks	• link action to impact • useful in simplified form for checking for second order impacts • handles direct and indirect impacts	• can become very complex if used beyond simplified version
Overlays	• easy to understand • good display method • good siting tool	• address only direct impacts • do not address impact duration or probability
GIS and computer expert systems	• excellent for impact identification and analysis • good for 'experimenting'	• heavy reliance on knowledge and data • often complex and expensive

Impact analysis/prediction

Provide a general introduction to the analysis and prediction of impacts. Note that much of the work in this phase must be carried out by specialists.[3]

Once the range impacts have been identified, the potential size and nature of each one must be predicted. Prediction draws on physical, biological, socio-economic and anthropological data and techniques and may employ mathematical models, photomontages, physical models, socio-cultural models, economic models, experiments or expert judgements. In many cases this work will need to be carried out by specialists in the areas of interest.

To prevent unnecessary expense, the sophistication of prediction methods used should be kept in proportion to the scope of the EIA and the importance of the particular impact. It is often very tempting for those involved in this phase of the work to become involved in research that is of interest to themselves rather than of direct relevance to the proposal. To avoid wasting time and money the programme of research and data collection must be focused on addressing the concerns outlined in the Terms of Reference.

Where possible, impacts should be predicted quantitatively. This makes comparison across alternatives and with baseline conditions easier. If quantification is difficult, then it is important that techniques are used that enable the impacts to be compared systematically. One technique could, for instance, take the form of a range of graded 'dot sizes' presented in a table. Sometimes, qualitative descriptions, such as of the quality of a landscape or habitat, will have to be used; however, the use of such descriptions should be minimised.

Discuss the interaction that must occur among those undertaking the various impact analyses and between these people and the project designers and managers.

It is important for the person managing the team of impact assessment specialists to communicate with them and to introduce them to each other so that they can communicate effectively. Regular team meetings can help to ensure that there is no unnecessary overlap in people's tasks and that no important areas have been neglected.

Communication links should also be established with those designing the project as it is often possible for design changes to be incorporated to reduce environmental impacts well before the production of the EIA report. This can result in savings of money and time to the proposal in the long run. (For further information on management refer to Topic 12—*Project Management*.)

Discuss the use of baseline studies and data collection. Show examples from local projects that have been well managed.

The change caused by a particular impact can be evaluated by comparing the expected future state of environmental components if the proposal were not to go ahead (the baseline condition for the no-development option) with the predicted state of those components if the proposal does proceed. Therefore, one of the first tasks involved in the detailed analysis of an impact is the collection of information that will help to describe the baseline situation at the expected time of implementation.

Although, in a theoretical sense, describing the baseline conditions should be a relatively straight-forward process, in practice there can be difficulties and expense in identifying and collecting appropriate information to undertake this task. Specialised knowledge is usually required to specify, and set appropriate limits on, the data collection required to meet the needs of any analysis and ongoing monitoring programmes that may be established.

In many cases it is likely that the current baseline conditions will still exist when a project is implemented. However, some proposals, in particular very large projects, may not commence for some time or may take a long time to complete. In these cases predictions will need to be made about what the future baseline conditions will be. This will involve consideration of the following factors:

9

- current status;
- current and expected trends;
- effects of proposals already being implemented; and
- effects of other proposals which will be completed before implementation of the proposal under consideration.

There will be some circumstances in which the collection of data will not be possible and the EIA specialist or team will have to use their judgement to make predictions. When this occurs it should be indicated in the EIA and an explanation provided.

EIA project managers need to exercise strict control to ensure that time and effort is not spent on unnecessary baseline data collection. Remembering that the object of EIA is not specifically to describe the baseline conditions, they may also wish to impose limits on the space in the EIA report devoted to the description of the baseline situation. For example, it could be decided to limit the baseline chapter or section to not more than ten per cent of the total number of pages in the report.

Define the word 'impact'. Outline the range of characteristics that impacts can have and discuss how these characteristics can be presented to decision-makers.

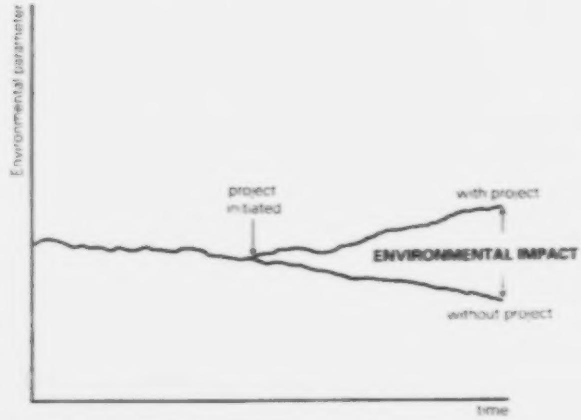
Wathern[3] describes an impact as having:

> both spatial and temporal components and can be described as the change in an environmental parameter, over a specified period and

> within a defined area, resulting from a particular activity compared with the situation which would have occurred had the activity not been initiated. (p7)

This can be seen pictorially in the figure below:

An Environmental Impact 10



Source: Wathern (1988)

When investigating the environmental impacts of a proposal it is important to note that impacts can vary in how, when and whether they will arise, and where and by how much they may affect the environment. Impacts can also interact to cause other impacts that might be more significant than the original impacts. Impacts vary in:

- nature (positive, negative, direct, indirect, cumulative, synergistic with others);
- magnitude; 11
- extent/location (area/volume covered, distribution);
- timing (during construction, operation, decommissioning, immediate, delayed, rate of change);
- duration (short term, long term, intermittent, continuous);
- reversibility/irreversibility;
- likelihood (risk, uncertainty or confidence in the prediction); and
- significance (local, regional, global).

Nature

The most obvious impacts are those that are directly related to the proposal, usually occurring at around the same time as the action that caused them. Typical examples of direct impacts are: loss of wetlands; destruction of ecosystems; relocation of households; increased air emissions etc.

Indirect or higher-order impacts are changes that are usually less obvious, occurring later in time or in a place other than where the original impacts occurred. Examples of these types of impacts are: the spread of malaria as a result of tree removal, pesticides in the breast milk of mothers in cities due to the use of agricultural pesticides, and increased traffic volumes and urban growth due to freeway development.

Impacts can be cumulatively added to the impacts from other sources. They can also interact with impacts from other sources to create new impacts or larger impacts than those originally occurring.

It should also be noted that impacts can be beneficial and that these too should be brought to the notice of decision-makers.

Magnitude

Estimating the size of the impact is of prime importance. However, it should be noted that sometimes small impacts can be much more important than large ones. For instance, very small quantities of some toxic substances can cause large scale health problems for humans and wildlife.

Extent/location

An indication of the location, distribution and size of the area(s) to be affected should be given for each impact. This is much easier for direct impacts but should also be attempted for other types of impacts.

Timing

Impacts arising from all of the stages of the life of the project should be considered (ie during construction, operation and decommissioning). Some impacts will occur immediately while others may be delayed, sometimes by many years. These characteristics of the impacts should be noted for the decision-makers.

Duration

Some impacts may be short-term, such as the noise arising from equipment during construction. Others may be long-term, such as the inundation of land during the building of a reservoir. Impacts such as blasting may be intermittent whereas others, such as electromagnetic fields caused by power lines, may be continuous.

Reversibility

Once the cause of an environmental impact has been removed it may be that the pre-existing environmental situation may be (more or less) restored to an equivalent socially desired state. If impacts are reversible (either naturally or with human assistance) then restoration is very much easier. However, some impacts are irreversible.

Likelihood (risk)

Not all impacts share the same likelihood of occurrence. Some can be predicted to occur, more or less definitely, whereas others are less certain (but still capable of probabilistic estimation), for example the release of a toxic gas from a chemical installation. In all cases some estimate should be made of the uncertainty or 'margin of error' involved in the prediction.

It is extremely difficult to describe all impacts in probabilistic terms. It is however easier, from a technical point of view, to determine the likelihood of the release of a certain amount of gas, and the attendant consequences, than to determine the likelihood of decline in populations of birds in a wetland which may be affected by drainage changes and discharge of certain effluents. Whenever possible, attempts should be made to explain the likelihood of an impact occurring and give reasons for the judgement made.

It is also important that impact assessment consider the effects of events that are low risk but high impact. Examples of these types of impacts include oil spills, failure of nuclear power plants etc.

Significance

The interpretation of significance at this stage of EIA depends on the importance of the impact for decision-making. In many cases this will be an assessment of the acceptability of the impact in terms of some existing criteria such as the permitted level of a substance or degree of change as specified in a standard, policy or plan. This concept is discussed further later in this topic.

Presentation of impact results

6–22 At the stage of preparing the EIA report a systematic format should be used to present information about impacts to decision-makers. One possible format is an 'Impact Characteristic Summary Table' below.

Impact characteristic summary table

	IMPACT TYPE		
IMPACT CHARACTERISTIC	air quality	health	etc
nature			
magnitude			
extent/location			
timing			
duration			
reversibility			
likelihood (risk)			
significance			

Outline the range of methods that can be used in impact analysis,[4] drawing attention to any local requirements at the appropriate stage of the discussion.[5]

There are a number of ways in which the characteristics of impacts can be predicted. These include:

13
- professional judgement
- quantitative mathematical models
- experiments, physical models, and
- case studies

These are discussed in general below. Specific examples of the use of analytical techniques can be found in the references listed at the end of this topic.

Professional judgement

It is important to note that all methods of analysis involve some degree of professional judgement.

The sole reliance on professional judgment can be unavoidable when there is a lack of data to support more rigorous analyses or there is a lack of analytical techniques with which to make the predictions (such as in the analysis of many social impacts).

Examples of the use of professional judgement include:

- a sociologist basing the prediction of the effect that a water supply proposal may have on the nature of women's work in the community; and
- an anthropologist using a workshop approach to assess the cultural significance of a communal place.

Specialist practitioners engaged for this type of analysis should be very experienced in their field, the type of proposal, the geographic region and in EIA. Where professional judgement is used without also employing other more objective methods, the EIA manager should be aware that the judgement and values of the specialist concerned may influence the outcome.

Quantitative mathematical models

Quantitative models are mathematical expressions developed to simulate some aspect of reality. Once they have been developed it is usually not difficult to make changes in the input conditions for the model and then to see how the outputs are affected. For instance, differences in air pollution can be calculated by changing, within the model, the height of a chimney stack or the rate of output of emissions.

When interpreting the output from quantitative mathematical models it should be remembered that all models are simplifications of the real world and require the specialist to make a number of assumptions in both their development and their use. If these assumptions are inappropriate then there can be significant implications for the accuracy and usefulness of the output data. EIA project managers should ask all specialists carrying out mathematical analyses to clearly state the assumptions inherent in the use of their models.

Examples of the use of quantitative models include:

- air dispersion models to predict rates and concentrations at various points; and
- hydrological modelling to predict changes in the flow regime of rivers.

Traditionally this type of analysis has been carried out for physical impacts. Increasingly, however, mathematical models are being developed to analyse biological, social/demographic and economic impacts.

Experiments and physical models

Experiments and physical modelling can be used to test and analyse the effects of project-like activities as well as the effectiveness of proposed mitigation techniques. Experiments can be done directly in the field or under laboratory conditions depending upon the nature of the impact and the resources available. Physical models can be built to predict the behaviour and effect of the actual project on the environment. A typical example of this would be using a physical model to assess the changes to sand movements resulting from port and marine projects. It must always be remembered when using the results of experiments or models that unpredicted outcomes can occur when experimental data is 'scaled up' to life size.

Examples of the use of experiments include:

- the exposure of fish in a laboratory to pollutants to determine rates of uptake and retention; and
- field trials of the effectiveness of different methods of erosion control.

Case studies

Reviewing case studies of similar proposals in similar environments can provide a good basis for confirming the direction and findings of impact assessment.

Briefly discuss the importance of undertaking a sensitivity analysis as part of the analysis of the impacts.

Because the relationship between impacts and effects may not be linear it can be found that small changes in impacts may cause larger than expected increases or decreases in the resulting magnitude of the environmental effects. An assessment should be made of the effect that small changes in the magnitude of the impact (say less than 10 per cent) have on the severity of the environmental effects, particularly if the magnitude of the impacts was uncertain to begin with. This is referred to as a sensitivity analysis.

Briefly discuss the types of considerations involved in the analysis of three of the non-biophysical impacts frequently considered during integrative EIA — social, health and economic[1]

Whilst there is considerable experience in analysing many of the biophysical impacts there is still a lack of confidence in dealing with the broader range of impacts that are now typically integrated into EIA. The discussion below of social, health and economic impacts serves as a brief introduction to some of these other impacts. For more detailed coverage of the analysis of these and other impacts refer to one of the references listed at the end of this session outline.

Social impact assessment

The close relationships between social and environmental systems make it imperative that social impacts are identified, predicted and evaluated in conjunction with biophysical impacts during EIA. People and their social groups are a component part of their environment and environmental changes are often linked to social change (and vice versa).

Social impacts include changes that affect individuals, institutions, communities and larger social systems as well as the interactions between them. In basic terms they are alterations in the way people live, work, play, relate to each other and organize to meet their needs as well as changes in the values, beliefs and norms that characterise their 'group' and guide their individual and collective actions.

Social impacts can be divided into three main types:

14

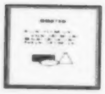
- *demographic impacts* such as changes in population numbers, population characteristics (such as sex ratio, age structure, in-and-out migration rates and resultant demand for social services, hospital beds, school places, housing etc);
- *cultural resource impacts* including changes in archaeological, historical and cultural artefacts and structures and environmental features with religious or ritual significance; and
- *socio-cultural impacts* including changes in social structures, social organizations, social relationships and accompanying cultural and value systems (language, dress, religious beliefs and rituals).

The assessment of social impacts involves the collection and analysis of demographic and socio-cultural data. Much of this data will be identified or generated during the public involvement programme for the EIA. It is therefore best if specialist social scientists both undertake the public involvement programme and analyse the social impacts. To maximise the potential for integration of social and biophysical impacts throughout the EIA the social scientists should be engaged at an early stage in the EIA and be an integral part of the EIA team.

Health impacts

The Asian Development Bank in their *Guidelines for the Health Impact Assessment of Development Projects* (1992) note that although development projects usually result in considerable benefits to people there are sometimes hidden and uncomputed costs associated with health and safety. These costs can reduce the overall profitability of the development. When environmental impact assessment includes the consideration of health impacts the potential health-related effects of development can be predicted, mitigated and managed far more cost effectively than if they are left to emerge after project implementation.

Health impacts can result directly from changes to the biophysical environment (such as exposure to toxic pollutants) or indirectly as the result of other changes caused by the project (eg lowered socio-economic status resulting in increased morbidity and mortality). The implementation of proposals can also increase the risk of accidents and disasters



15

An example of the types of health hazards that could be caused if not mitigated through EIA can be seen in the table on the next page.

Major health impacts of development projects - some examples

	Communicable disease	*Non-Communicable disease*	*Nutrition*	*Injury*
Transport	Δ			🚗
Mining		Ω		⛏
Energy		🔥		
Natural Resources	🍃		☁	
Public Services	👫			
Manufacture and Trade		🏢		✹

Δ	Brazil, 1970s - Half the malaria cases in Amazonia were linked to the narrow area of influence of the Transamazon Highway. Uganda, 1986 - Along the main link road to Kenya, 32% of the truck drivers and 68% of the women working in bars were HIV positive.
🚗	Papua New Guinea, 1980s - Traffic accidents were estimated to cost 1% of GNP.
Ω	South Africa, 1980s - Many miners suffered from permanent dust-induced lung damage. This activates latent tuberculosis. Infection rates were 800-1000 per 100,000.
⛏	Bolivia, 1970s - The population of 24,000 mineworkers in large mines had 5,430 injuries.
🔥	Household cooking on open fires may be the largest single occupational health problem of women. It leads to many respiratory and eye diseases.
🍃	Sri Lanka, 1986 - A rice development project created breeding sites for mosquitoes which transmit Japanese encephalitis. Pigs near the rice fields provided the virus. The result was an epidemic.
☁	Sri Lanka 1970s - On some tea estates child labour was common, education facilities minimal and water supplies inadequate. Chronic malnutrition and infant mortality rates were twice the rural average. Kenya, 1980s - Participants in a dairy development project sold the available milk for cash. They did not reserve enough milk to feed their children.
👫	Burma, 1950s - Satellite towns built on swampy land became waterlogged during the rains. Mosquito breeding increased. Filariasis was transmitted.
🏢	Cubato, Brazil, 1980s - There were 23 major industrial plants and many small operations. A high rate of respiratory disorders was associated with high levels of water and air pollution. Neonatal mortality and birth deformities increased.
✹	In developing countries, the annual rate of accidents causing disabling injuries to workers is 21-34%, compared to 3% in the UK.

Source: Birley, M. – Liverpool School of Tropical Medicine

Economic and fiscal impacts

Economic impact assessment is carried out to predict changes in employment, per capita income and levels of business activity resulting from a proposal. Economic impacts are often a major cause of social impacts.

Fiscal impacts are the changes in the costs and revenues of the various government sectors. These changes typically occur as the result of the proposal causing large increases in population and the consequent demand that this can place on the community infrastructure provided by government eg. health services, roads, sewerage etc.

As with other impacts, appropriate baseline data needs to be collected to describe the baseline economic and fiscal situations (without the proposal) and then prediction techniques are required to describe the changes occurring if the proposal is implemented. Specialised prediction techniques are available to model both economic and fiscal changes (eg. input-output models (I-O) for economic changes). The factors that typically affect economic and fiscal impacts can be found in the box below.

Box 2: Factors affecting economic and fiscal impacts

16

Factors affecting economic impacts

- duration of construction and operational periods;
- workforce requirements for each period and phase of construction including numbers to be employed during the peak phase for construction works;
- skill requirements (local availability);
- earning;
- raw material and other input purchases;
- capital investment;
- outputs; and
- the characteristics of the local economy.

17

Factors affecting fiscal impacts

- size of investment and workforce requirements;
- capacity of existing service delivery and infrastructure systems;
- local/regional tax or other revenue raising processes; and
- likely demographic changes arising from project requirements (these need to be estimated during the assessment of social impacts).

Impact Significance

(Note: impact significance was also discussed in Topic 4—Screening and Topic 5—Scoping in the process of identifying which impacts require further investigation.)

Outline the importance of determining significance and discuss the different criteria that can be used.

Once the impacts have been analysed, it is important to determine their significance, that is, whether they are acceptable, require mitigation, or are unacceptable to the community. Note that care should be taken to ensure that the assessment of significance is not confused with making the decision about the future of the proposal. This latter task is the role of the decision-maker who can use the significance information in the decision-making process.

The significance of an impact is determined by the joint consideration of the impact characteristics and the importance (or value) attached to them.

18

IMPACT CHARACTERISTICS (magnitude) X IMPACT IMPORTANCE (value) ➔ IMPACT SIGNIFICANCE

As discussed earlier in this topic, determining the importance of the various issues can sometimes be approached by comparing the likely or predicted impacts with current standards. If the proposal, including the adopted mitigating measures, does not cause the standard to be exceeded, the issue might be considered to have been adequately addressed. If the anticipated impact is well below the standard, it might be that the issue needs no further consideration. (It should be noted that just because an impact is large does not mean that it is significant, and vice versa.)

However, reliance on standards suffers from two deficiencies – there may be no appropriate technical standard (eg. social impacts, visual impacts, clearing of vegetation) and there may be no community confidence in or agreement on the standards that have been established (eg. blood lead levels, traffic noise levels, electromagnetic field strengths).

Another approach is to consider sustainable development criteria, such as the preservation of genetic diversity, the wise use of resources, and consideration of the welfare of future generations. A difficulty with this approach is the lack of sufficient environmental data to enable such analysis to be pursued.

A list of the types of evaluation criteria that could be used (or adapted) as the starting point for developing a set of specific sustainability criteria can be seen in the box below.

Box 3: Sustainability evaluation criteria

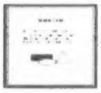
Maintenance of habitat and ecosystems
Preservation of native plant species
Preservation of native animal species
Preservation of areas of landscape/amenity value
Preservation of areas of cultural value
Reclamation and reuse of wastewater
Wastewater disposal within assimilative capacity
Groundwater extraction within sustainable yield
Improvement in surface water quality
Improvement in groundwater quality
Productive use of fertile soils
Prevention of erosion
Application of clean technology
Waste recycling or use
Material utilisation allowing recycling or reuse
Increased use of metal substitutes

(Fleming and Daniell, 1995)

Compatibility with existing operations or services
Local infrastructure compatibility
Minimisation of greenhouse gas emission
Airborne disposal within assimilative capacity
Use of renewable energy sources
Energy efficiency
Public acceptability
Involvement of the community
Improved recreational opportunities
Improved access to public open spaces
Full cost recovery for good or service
Annual equivalent cost-benefit ratio
Costs borne by consumers
Equitable cost-benefit distribution
Increase in employment opportunities
Unit cost for good or service
Capital cost funding capability

Ultimately, the significance of issues and their relative importance is subjective. Even the apparently scientific establishment of environmental discharge standards will have involved the balancing of environmental quality and economic reality. Significance must be derived from community preferences and can be discovered through public involvement or other specialised methods (eg. Delphi). The approach used to determine significance must take into account the social and cultural aspects of local value systems and traditional practices. Some of the impact identification techniques discussed earlier in this topic (eg. Batelle checklist) have built-in scales or weightings (and hence values) establishing the importance of parameters based on prior experience.

In most cases the individual specialist or the EIA team will be required to identify or establish a set of justifiable significance criteria by which the impacts can be evaluated. Sadar (1995), for instance observes that the key bases for assessing impact significance are the:



19

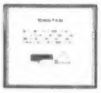
- level of public concern (particularly over health and safety);
- scientific and professional judgement;
- disturbance/disruption of valued ecological systems; and
- degree of negative impact on social values and quality of life.

When defining specific criteria for determining impact significance, he suggests they should:

20

- permit the assignment of significance in a rational way through discussion and consensus;
- provide a measure of consistency necessary for the comparison of alternatives; and
- serve as documentation of the values and beliefs on which judgements are based.

Sadar outlines a range of significance criteria under the four categories discussed below:

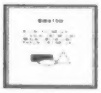


21

- ecological importance
- social importance
- environmental standards; and
- statistical significance

Ecological importance

The following criteria relating to ecological importance include aspects of the environment critical for ecosystem functioning as well as those valued for aesthetic or sentimental reasons:



22

- effect on plant and animal habitat;
- rare and endangered species;
- ecosystem resilience, sensitivity, biodiversity and carrying capacity; and
- viability of local species population.

Social importance

Biophysical impacts are translated into effects on factors valued by humans. The following concerns influence the perception of environmental value:

- effects on human health and safety;
- potential loss of species with current or potential value, or commercially available production (farmland); 23
- recreational or aesthetic value;
- demands on public resources such as social services;
- demands on transportation and other infrastructure; and
- demographic effects.

Environmental standards

Environmental standards are among the most common means for assessing significance. These are criteria designed to contain certain environmental conditions within specified limits believed to be requisite to achieve social objectives (usually health-related). Examples include:

- limits on effluent discharge concentrations;
- clean air and water quality standards, policies or plans; and
- 24 plans or policies that protect areas or limit the use of natural resources.

Statistical significance

Some environmental characteristics may display shifts from their normal (no-project) variability. A statistical significance threshold may be established to define an acceptable range of variation. This approach is often limited by the lack of knowledge concerning the nature of background variability (baseline conditions, trends) inherent in natural systems.

Briefly discuss the role of mitigation in the management of significant impacts.

Topic 10–*Decision-making* discusses approaches that can be used to assist choosing between proposal alternatives. Depending upon the target group and their needs, some of this information could be presented with this topic.

Very briefly stress the importance of the presentation of the EIA report to the effective communication of impact assessment results.

Environmental impact assessment can only be effective if the results of the process are presented in a manner that decision-makers can use and understand. Topic 8—*Reporting* provides a useful guide to the presentation of an EIA report. To reach the widest possible audience, non-technical summaries, recommendations, tables and diagrams should be used whenever possible to present information.

Include a training activity to reinforce the topic (if desired).

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Bisset, R. (1996) *EIA: Issues, Trends and Practice.* UNEP Environment and Economics Unit. Nairobi
2. OECD/DAC Working Party (1994) *Towards Coherence in Environmental Assessment.* Canada
3. Wathern, P. (1988) An Introductory Guide to EIA. In *Environmental Impact Assessment: Theory and Practice.* Wathern, P. Routledge. London
4. United Nations ESCAP (1990) *Environmental Impact Assessment Guidelines for Water Resources Development.* Bangkok
5. Boyle, J. and Mubvami, T. (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe.* Department of Natural Resources, Ministry of Environment and Tourism. Zimbabwe

Asian Development Bank (1992) *Guidelines for the Health Impact Assessment of Development Projects.* ADB Environment Paper No. 11. Manilla

Fleming, N.S. and Daniell, T.M. (1995) *Matrix for Evaluation of Sustainability Achievement (MESA): Determining the Sustainability of Development.* National Conference on Environmental Engineering. Institute of Engineers, Australia. Melbourne.

Sadar, H. (1995) *Environmental Impact Assessment.* Carleton University Press. Ottawa

Further reading

Bisset, R. (1987) Methods for Environmental Impact Assessment: A Selective Survey with Case Studies. In *Environmental Impact Assessment for Developing Countries.* Ed. Biswas, A.K. and Qu Geping. Tycooly International. London. Chapter 1

Glasson, J, Therival, R. and Chadwick, A. (1994) *Introduction to Environmental Impact Assessment.* UCL Press. London

Hilden, M. (1995) *Evaluation of the Significance of Environmental Impacts.* EIA Process Strengthening Workshop. Canberra

Ortolano, L. (1984) Approaches to Forecasting Environmental Impacts. In *Environmental Planning and Decision-making.* Ed. Ortolano, L. Wiley. New York, Chapter 7

Sadler, B. (1996) *International Study of the Effectiveness of Environmental Assessment.* CEAA and IAIA. Canada

Vanclay, F. and Bronstein, D. A. (1995) *Environmental and Social Impact Assessment.* Wiley. Chichester

Walters, C.J. and Holling, C.S. (1990) Large-Scale Management Experiments and Learning by Doing. *Ecology.* vol. 71 pp 2060-2068

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

Impact Identification

6–1 What are the strengths and weaknesses of the different types of impact identification methods used locally? To what situation is each best suited?

6–2 What care would need to be taken if computer-aided EIA methods were to be implemented?

6–3 Agricultural chemicals are found in the breast milk of mothers even in cities that are a long way from agricultural areas. What methods could be used to predict indirect impacts of proposals such as this?

Impact Analysis/Prediction

6–4 Environmental assessment is intended to identify and evaluate the consequences of a particular project or programme. At what points does the process involve value judgements and how should these be made?

6–5 What are the possible consequences of not carrying out sensitivity analyses of impacts?

6–6 Critique the following statements from EIA reports:

   a) The dam will flood the habitat of 40 nesting pairs of orange crested gooney birds. This will be an insignificant impact.

   b) The impact on demand for health services will not be of major significance.

   c) An increase in the local population by 200 families due to the project will not cause a significant impact on social services.

Impact Significance

6–7 Discuss the difference between determining significance and decision-making.

6–8 Who should be responsible for determining significance? What criteria should be used as the basis of determining the significance of different impacts?

6–9 Discuss the following statement 'But the standard says that the allowable discharge limit is 5ml per 100 litres. There's no value judgement in that.'

6–10 What methods could be used to determine the importance weighting of an impact?

Speaker themes

6–1 Invite a speaker who is experienced in managing local EIAs to discuss the various methodologies that have been used and how they could be improved in future work. The presentation should be supported by examples of the work.

6–2 Invite a speaker who has experience with GIS or expert systems to show the participants how they work and what they can be used for. Ensure that some of the discussion covers the data requirements for the systems.

6–3 Invite a speaker to outline the use of a particular detailed analytical technique that is of relevance to the group of participants.

Group Activity 6-1: Assessing—Impact identification

Title	**Using impact identification methodologies**
Aim	To discover the strengths and weaknesses of the different impact identification methods available.
Group size	Four to six people
Duration	Half to one day, depending on the desired level of detail.

Resources required

- ❑ Background information from local case study project(s).
- ❑ Examples of a range of checklists, matrices etc that can be adapted for use for the case study project.
- ❑ List of criteria that could be used to assess different impact identification methods eg ease of use, general coverage, ability to identify indirect impacts etc.

Description of activity:

- ❑ Get the group as a whole to adapt/develop the list of criteria to be used to assess the impact identification methods.
- ❑ Assign each group the task of using one of the impact identification methods (matrix, checklist etc) to establish the impacts for a case study project.
- ❑ Get each group to assess the method using the list of criteria established earlier.
- ❑ Get each small group to present to the group as a whole a summary of the identification method they used and any problems that they encountered, and the impacts they identified and how the method rated using the assessment criteria.

Group Activity 6-2: Assessing—Impact identification

Title	**Using a Leopold matrix**
Aim	To give the participants practice in applying a Leopold matrix to a real project.
Group size	Four to six people
Duration	Half to one day, depending on the level of detail.

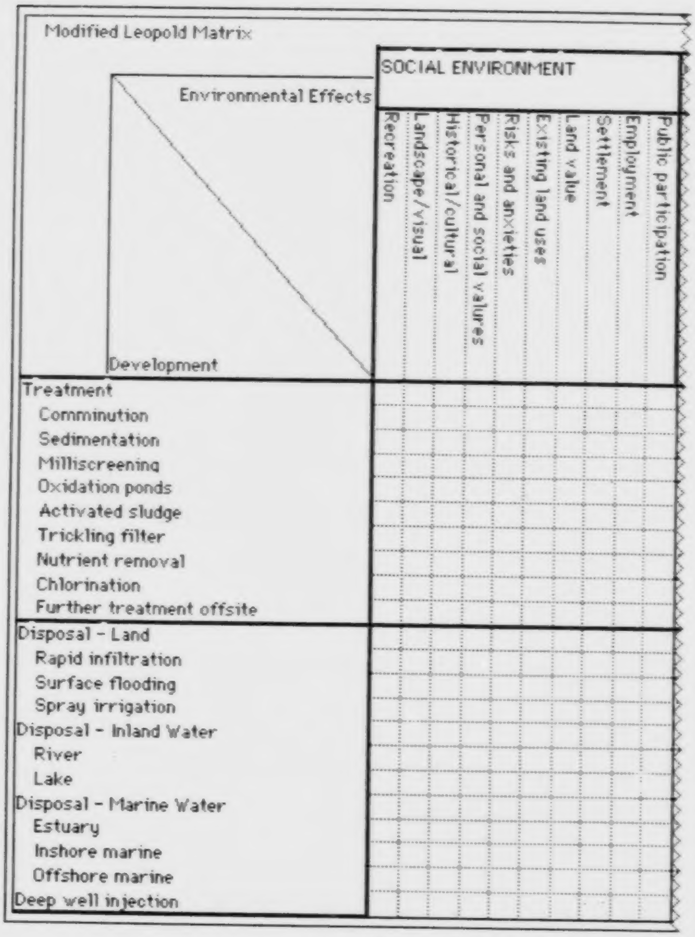
Resources required

- ☐ Background information from local case study project(s).
- ☐ Modified Leopold matrix (obtain one used locally if possible).
- ☐ Copies of handout 'Using a Leopold Matrix'

Description of activity:

- ☐ Using the matrix, identify all actions that are part of the project (from the horizontal axis).
- ☐ For each action, work down the list of environmental characteristics and place a diagonal line in all of those where an impact is possible.
- ☐ For each cell containing a diagonal line rank the magnitude of the impact on a scale from 1 (least) to 10 (most) and place the rank in the top left corner of the cell (a plus (+) may be used for positive impacts and a minus (-) can be used for negative impacts).
- ☐ In the lower right hand corner of each cell place a number from 1 (least) to 10 (most) to indicate the importance of the impact (this importance weighting should be determined using an acceptable group process).
- ☐ Provide a written report on the most significant impacts to accompany the table.
- ☐ As a whole group, review the success of using the matrix.

Using a Leopold Matrix



Modified Leopold Matrix

Environmental Effects Development	SOCIAL ENVIRONMENT									
	Recreation	Landscape/visual	Historical/cultural	Personal and social valures	Risks and anxieties	Existing land uses	Land value	Settlement	Employment	Public participation
Treatment										
Comminution										
Sedimentation										
Milliscreening										
Oxidation ponds										
Activated sludge										
Trickling filter										
Nutrient removal										
Chlorination										
Further treatment offsite										
Disposal - Land										
Rapid infiltration										
Surface flooding										
Spray irrigation										
Disposal - Inland Water										
River										
Lake										
Disposal - Marine Water										
Estuary										
Inshore marine										
Offshore marine										
Deep well injection										

The steps in using a Leopold-type matrix are:

- identify all actions that are part of the project (across top of table);
- for each action, work down the list of environmental characteristics and place a diagonal line in all of those where an impact is possible;
- for each cell containing a diagonal line rank the magnitude of the impact on a scale from 1 (least) to 10 (most) and place the rank in the top left corner of the cell (a plus (+) may be used for positive impacts and a minus (-) can be used for negative impacts);
- in the lower right hand corner of each cell place a number from I (least) to 10 (most) to indicate the importance of the impact (this importance weighting should be determined using an acceptable group process); and
- provide a written report on the most significant impacts.

Group Activity 6-3: Assessing—Impact identification

Title	**Looking for secondary impacts**
Aim	To raise awareness of the importance of assessing secondary and cumulative impacts.
Group size	Four to six people
Duration	Two hours

Resources required

❑ Background information for a case study from a local project, in particular the project description and a list of direct impacts.

Description of activity:

❑ Examine the project details and list of direct impacts.

❑ Assess whether the list is complete for regional, national, international and global impacts.

❑ What potential is there for secondary, cumulative and synergistic impacts from the project?

❑ As a whole group discuss both the implications of not assessing these impacts for this project and possible effects if they are not assessed over a series of similar projects.

Group Activity 6-4: Assessing—Impact analysis

Title	**Developing plans for baseline data collection**
Aim	To work through the exercise of identifying impacts and then develop a plan for the collection of baseline data.
Group size	Four to six people
Duration	Half to one day, depending on the level of detail required by participants.

Resources required

- Background information for a local case study including the plan that was used as the basis of the data collection.
- Checklist or matrix appropriate for use in local EIA process.

Description of activity:

- Given the project description, use the checklist or matrix to identify the major impacts that require further analysis.
- For each impact, list the types of baseline data that could be required and identify any sources that may already exist for obtaining the information.
- Compare the strengths and weaknesses of the list that the groups have developed with that developed for the actual project.

Group Activity 6-5: Assessing—Impact significance

Title **How was significance determined?**

Aim To evaluate the adequacy of an EIA in stating the values that have been used in determining impact significance.

Group size Pairs

Duration Half day

Resources required:

☐ An EIA report for each pair

Description of activity:

Each pair is to:

☐ review the EIA report, listing the impacts that were analysed;

☐ for each impact, identify the significance criteria by which the impact was judged; and

☐ if project alternatives were presented, identify the method by which these were compared and the preferred alternative chosen.

☐ The whole group should convene to discuss the findings.

1

The 'assessing' phase of EIA involves:

- identifying and defining the impacts more specifically
- analysing impacts
- determining impact significance or acceptability

2

The term 'environment' includes:

- human health, well-being, environmental media, ecosystems and agriculture
- climate and the atmosphere
- natural resources (regenerative and mineral)
- utilisation and disposal of residues and wastes
- resettlement, archaeological sites, landscape, monuments and social consequences as well as upstream, downstream and transboundary effects

DAC/OECD

3

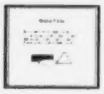
Impact identification methods:

- checklists
- matrices
- networks
- overlays and geographic information systems (GIS)
- expert systems
- professional experience

4

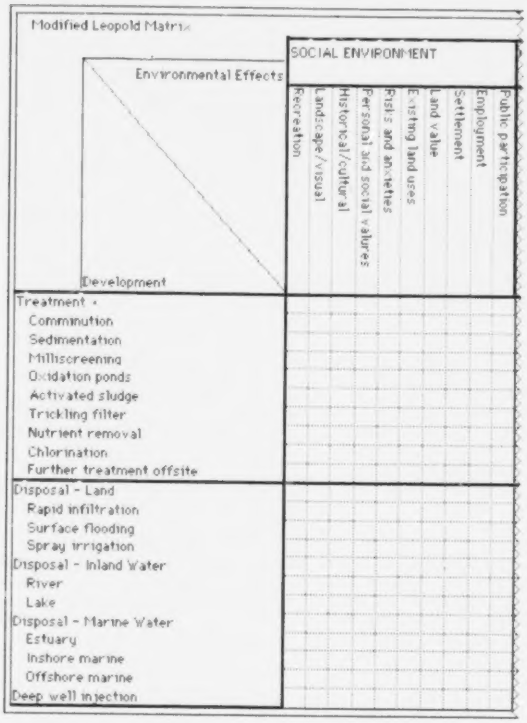
Sample of a checklist

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1 Require the acquisition or conversion of significant areas of land for reservoir/treatment works etc (eg >50 ha rural, >5 ha urban)?	☐	☐	☐
	2 Result in significant quantities of eroded material, effluent or solid wastes?	☐	☐	☐
	3 Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
Receptors of Impacts	4 Flood or otherwise affect areas which support conservation worthy terrestrial or aquatic ecosystems flora or fauna (eg protected areas, wilderness areas, forest reserves, critical habitats, endangered species), or that contain sites of historical or cultural importance?	☐	☐	☐
	5 Flood or otherwise affect areas which will affect the livelihoods of local people (eg require population resettlement, affect local industry, agriculture, livestock or fish stocks, reduce the availability of natural resource goods and services)?	☐	☐	☐
	6 Involve siting sanitation treatment facilities close to human settlements (particularly where locations are susceptible to flooding)?	☐	☐	☐
	7 Affect sources of water extraction?	☐	☐	☐
Environmental Impacts	8 Cause a noticeable permanent or seasonal reduction in the volume of ground or surface water supply?	☐	☐	☐
	9 Present a significant pollution risk through liquid or solid wastes to humans, sources of water extraction, conservation worthy aquatic ecosystems and species, or commercial fish stocks?	☐	☐	☐
	10 Change the local hydrology of surface water bodies (eg streams, rivers, lakes) such that conservation-worthy or commercially significant fish stocks are affected?	☐	☐	☐
	11 Increase the risk of diseases in areas of high population density (eg onchocerciasis, filariasis, malaria, hepatitis, gastrointestinal diseases)?	☐	☐	☐
	12 Induce secondary development, eg along access roads, or in the form of entrepreneurial services for construction and operational activities?	☐	☐	☐
Mitigation Measures	13 Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐
Comments				
	I recommend that the programme be assigned to Category Signature Delegation Desk	☐		



5

Sample of Leopold type matrix

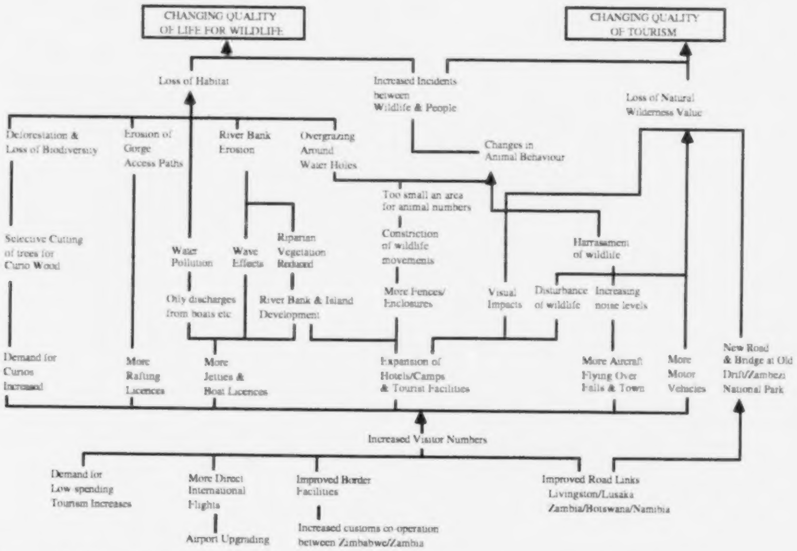


Modified Leopold Matrix

	SOCIAL ENVIRONMENT									
Environmental Effects Development	Recreation	Landscape/visual	Historical/cultural	Personal and social values	Risks and anxieties	Existing land uses	Land value	Settlement	Employment	Public participation
Treatment -										
Comminution										
Sedimentation										
Milliscreening										
Oxidation ponds										
Activated sludge										
Trickling filter										
Nutrient removal										
Chlorination										
Further treatment offsite										
Disposal - Land										
Rapid infiltration										
Surface flooding										
Spray irrigation										
Disposal - Inland Water										
River										
Lake										
Disposal - Marine Water										
Estuary										
Inshore marine										
Offshore marine										
Deep well injection										

6

A network


CHANGING QUALITY OF LIFE FOR WILDLIFE
CHANGING QUALITY OF TOURISM
Loss of Habitat
Increased Incidents between Wildlife & People
Loss of Natural Wilderness Value
Deforestation & Loss of Biodiversity
Erosion of Gorge Access Paths
River Bank Erosion
Overgrazing Around Water Holes
Changes in Animal Behaviour
Too small an area for animal numbers
Constriction of wildlife movements
Harrasament of wildlife
Selective Cutting of trees for Curio Wood
Water Pollution
Wave Effects
Riparian Vegetation Reduced
Oily discharges from boats etc
River Bank & Island Development
More Fences/ Enclosures
Visual Impacts
Disturbance of wildlife
Increasing noise levels
Demand for Curios Increased
More Rafting Licences
More Jetties & Boat Licences
Expansion of Hotels/Camps & Tourist Facilities
More Aircraft Flying Over Falls & Town
More Motor Vehicles
New Road & Bridge at Old Drift/Zambezi National Park
Increased Visitor Numbers
Demand for Low spending Tourism Increases
More Direct International Flights
Airport Upgrading
Improved Border Facilities
Increased customs co-operation between Zimbabwe/Zambia
Improved Road Links Livingston/Lusaka Zambia/Botswana/Namibia

Network Showing Impact Linkages Leading to Changes in Quality of Life, Wildlife and Tourism (arising from increased visitor numbers) (Bisset)

7

Choice of EIA method depends on:

- type and size of the proposal
- type of alternatives being assessed
- nature of the likely impacts
- nature of the EIA method
- experience in using the EIA method
- resources available
- nature of the public involvement
- experience of the proponent
- procedural/administrative requirements

8

Main Advantages and Disadvantages of Impact Identification Methods

	ADVANTAGES	DISADVANTAGES
Checklists **-simple** **-ranking and weighting**	• simple to understand and use • good for site selection and priority setting	• do not distinguish between direct and indirect impacts • do not link action and impact • the process of incorporating values can be controversial
Matrices	• link action to impact • good method for displaying EIA results	• difficult to distinguish direct and indirect impacts • significant potential for double-counting of impacts
Networks	• link action to impact • useful in simplified form for checking for second order impacts • handles direct and indirect impacts	• can become very complex if used beyond simplified version
Overlays	• easy to understand • good display method • good siting tool	• address only direct impacts • do not address impact duration or probability
GIS and computer expert systems	• excellent for impact identification and analysis • good for 'experimenting'	• heavy reliance on knowledge and data • often complex and expensive

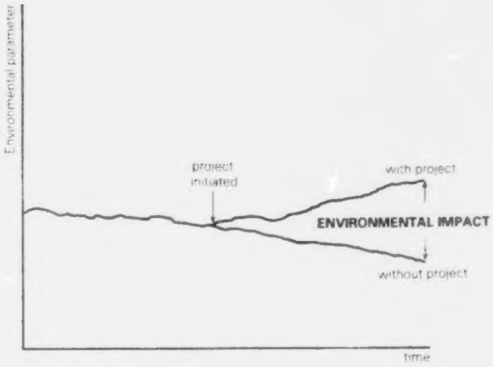
9

Information required about the environment to establish baseline conditions:

- current status
- current and expected trends
- effects of proposals already in implementation
- effects of proposals not yet implemented

10

An Environmental Impact



(Wathern, 1988)

11

Impacts can vary in:

- nature (positive, negative, indirect, cumulative, synergistic)
- magnitude
- extent/location (area/volume covered, where impact occurs)
- timing (during construction, operation, decommissioning, immediate, delayed)
- duration (short term, long term, intermittent, continuous)
- reversibility/irreversibility
- likelihood (risk, uncertainty or confidence in the prediction)
- significance (local, regional, global)

12

Impact characteristic summary table

	IMPACT TYPE		
IMPACT CHARACTERISTIC	air quality	health	etc
nature			
magnitude			
extent/location			
timing			
duration			
reversibility			
likelihood (risk)			
significance			

13

Methods of analysis of impacts:

- professional judgement
- quantitative mathematical models
- experiments, physical models
- case studies

14

Social impacts

- demographic
- cultural resource
- socio-cultural

15

Health impacts

	Communicable disease	*Non-Communicable disease*	*Nutrition*	*Injury*
Transport	Δ			🚗
Mining		Ω		⚒
Energy		🔥		
Natural Resources	🌲		☁	
Public Services	👫			
Manufacture and Trade		🏢		⚙

Δ	Brazil, 1970s - Half the malaria cases in Amazonia were linked to the narrow area of influence of the Transamazon Highway. Uganda, 1986 - Along the main link road to Kenya, 32% of the truck drivers and 68% of the women working in bars were HIV positive.
🚗	Papua New Guinea, 1980s - Traffic accidents were estimated to cost 1% of GNP.
Ω	South Africa, 1980s - Many miners suffered from permanent dust-induced lung damage. This activates latent tuberculosis. Infection rates were 800-1000 per 100,000.
⚒	Bolivia, 1970s - The population of 24,000 mineworkers in large mines had 5,430 injuries.
🔥	Household cooking on open fires may be the largest single occupational health problem of women. It leads to many respiratory and eye diseases.
🌲	Sri Lanka, 1986 - A rice development project created breeding sites for mosquitoes which transmit Japanese encephalitis. Pigs near the rice fields provided the virus. The result was an epidemic.
☁	Sri Lanka 1970s - On some tea estates child labour was common, education facilities minimal and water supplies inadequate. Chronic malnutrition and infant mortality rates were twice the rural average. Kenya, 1980s - Participants in a dairy development project sold the available milk for cash. They did not reserve enough milk to feed their children.
👫	Burma, 1950s - Satellite towns built on swampy land became waterlogged during the rains. Mosquito breeding increased. Filariasis was transmitted.
🏢	Cubato, Brazil, 1980s - There were 23 major industrial plants and many small operations. A high rate of respiratory disorders was associated with high levels of water and air pollution. Neonatal mortality and birth deformities increased.
⚙	In developing countries, the annual rate of accidents causing disabling injuries to workers is 21-34%, compared to 3% in the UK.

Source: Birley, M. – Liverpool School of Tropical Medicine¶

16

Factors affecting economic impacts

- duration of construction and operation
- workforce requirements for each period
- skill requirements (local availability)
- earning
- raw material and other input purchases
- capital investment
- outputs
- the characteristics of the local economy

17

Factors affecting fiscal impacts

- size of investment and workforce requirements
- capacity of existing service delivery and infrastructure systems
- local/regional tax or other revenue raising processes
- demographic changes arising from project requirements

18

IMPACT CHARACTERISTICS (magnitude) X IMPACT IMPORTANCE (value) ➔ IMPACT SIGNIFICANCE

19

Key elements for assessing impact significance:

- level of public concern
- scientific and professional judgement
- disturbance/disruption of valued ecological systems
- negative impact on social values and quality of life

20

Criteria for assessing impact characteristics should:

- assign significance in a rational way
- provide consistency for the comparison of alternatives
- document the values and beliefs on which judgements are based

21

Impact significance criteria include:

- ecological importance
- social importance
- environmental standards
- statistical significance

22

Ecological importance:

- effect on plant and animal habitat
- rare and endangered species
- ecosystem resilience, sensitivity, biodiversity and carrying capacity
- viability of local species population

23

Social importance:

- effects on human health and safety
- potential loss of species or of farmland
- recreational or aesthetic value
- demands on public resources
- demands on transportation and other infrastructure
- demographic effects

24

Environmental standards:

- limits on effluent discharge concentrations
- clean air standards, water quality standards
- plans or policies that protect or limit use of natural resources

Checklist for Rural and Urban Water Supply and Sanitation Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or conversion of significant areas of land for reservoir/treatment works etc. (e.g. > 50 ha rural, > 5 ha urban)?	☐	☐	☐
	2. Result in significant quantities of eroded material, effluent or solid wastes?	☐	☐	☐
	3. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
Receptors of Impacts	4. Flood or otherwise affect areas which support conservation worthy terrestrial or aquatic ecosystems, flora or fauna (eg protected areas, wilderness areas, forest reserves, critical habitats, endangered species); or that contain sites of historical or cultural importance?	☐	☐	☐
	5. Flood or otherwise affect areas which will affect the livelihoods of local people (eg require population resettlement; affect local industry, agriculture, livestock or fish stocks; reduce the availability of natural resource goods and services)?	☐	☐	☐
	6. Involve siting sanitation treatment facilities close to human settlements (particularly where locations are susceptible to flooding)?	☐	☐	☐
	7. Affect sources of water extraction?	☐	☐	☐
Environmental Impacts	8. Cause a noticeable permanent or seasonal reduction in the volume of ground or surface water supply?	☐	☐	☐
	9. Present a significant pollution risk through liquid or solid wastes to humans, sources of water extraction, conservation worthy aquatic ecosystems and species, or commercial fish stocks?	☐	☐	☐
	10. Change the local hydrology of surface water-bodies (eg streams, rivers, lakes) such that conservation-worthy or commercially significant fish stocks are affected?	☐	☐	☐
	11. Increase the risk of diseases in areas of high population density (eg onchocerciasis, filariasis, malaria, hepatitis, gastrointestinal diseases)?	☐	☐	☐
	12. Induce secondary development, eg along access roads, or in the form of entrepreneurial services for construction and operational activities?	☐	☐	☐
Mitigation Measures	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Waste Disposal and Treatment Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the disposal of large volumes or potentially hazardous wastes (eg domestic refuse, sewage sludge, industrial wastes, clinical wastes)?	☐	☐	☐
	2. Require the acquisition or conversion of large areas of land (significance dependent upon type of waste; type of facility eg landfill, land spreading, incineration etc; proximity to human settlements etc.)?	☐	☐	☐
	3. Require the dumping of wastes at sea or into inland water-bodies?	☐	☐	☐
	4. Require large scale construction activities (significance dependent upon sensitivity of environment, number of labourers to be accommodated, quantities of wastes or eroded materials)?	☐	☐	☐
Receptors of Impacts	5. Conflict with existing land ownership and land uses (eg urban areas, agricultural land, utilised water resources)?	☐	☐	☐
	6. Result in the location of disposal facilities in or near areas which support conservation-worthy terrestrial or aquatic ecosystems, flora or fauna (eg protected areas, wilderness areas, critical habitats, endangered species, lakes, lagoons or rivers); or that contain sites of historical or cultural importance?	☐	☐	☐
	7. Require landfill sites to be sited on land that may rapidly drain rainfall to surface water courses or leach to groundwater aquifers?	☐	☐	☐
Environmental Impacts	8. Present a pollution risk to humans due to contamination of sources of potable water supplies or to conservation-worthy ecosystems/species or fish stocks due to contamination of surface water-bodies?	☐	☐	☐
	9. Present an air pollution risk to humans due to land-fill disposal (eg methane odours); or incineration disposal (eg toxic gases metal particulates methane $C0_2$ and SO_2?	☐	☐	☐
Mitigation Measures	10. Allow for recycling options?	☐	☐	☐
	11. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation....................................... Desk.................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Urban Development (Building Construction) Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or utilisation of a significantly large area of land (eg > 5 hectares)?	☐	☐	☐
	2. Result in significant quantities of eroded materials, domestic refuse or effluent?	☐	☐	☐
	3. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual labourers)?	☐	☐	☐
	4. During project design, exceed the capacity of the existing water supply and sanitation system to accommodate its sewage, waste treatment and disposal requirements?	☐	☐	☐
Receptors of Impacts	5. Be located in (or require the routing of associated infrastructure through) areas that support sites or monuments of historical or cultural importance?	☐	☐	☐
	6. Require the resettlement or compensation of local people?	☐	☐	☐
	7. Use space previously reserved for parks, playgrounds or greenbelts?	☐	☐	☐
	8. Once operational, conflict with existing regional water extraction (eg by other communities or agriculture)?	☐	☐	☐
Environmental Impacts	9. During construction, present a significant pollution hazard to workers and local communities (eg dust, fumes, accidents with hazardous materials)?	☐	☐	☐
	10. Significantly affect, positively or negatively, land values adjacent to the project site (eg > 10%, or require provision of financial compensation)?	☐	☐	☐
	11. Once operational, present a significant pollution risk to potable water supplies, or significantly reduce the waste absorption capacity of downstream water courses?	☐	☐	☐
Mitigation Measures	12. Require competent health and safety staff with a separate, minimum budget?	☐	☐	☐
	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Transport Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require large volumes of construction materials to be taken from local sources (eg gravel, rock, water by dredging, quarrying, tapping etc.)?	☐	☐	☐
	2. Result in significant quantities of wastes or eroded material (dependent upon waste type, season of heavy rainfall)?	☐	☐	☐
	3. Require significant levels of accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
Receptors of Impacts	4. Be routed such that population resettlement or compensation is required?	☐	☐	☐
	5. Be routed through areas that support conservation-worthy ecosystems, flora or fauna (eg protected areas, wilderness areas, wetlands, tropical forest, critical habitats, endangered species); or sites of historical or cultural importance?	☐	☐	☐
	6. Be routed across major drainage channels (rivers, canals) or surface water-bodies (lakes, lagoons)?	☐	☐	☐
Environmental Impacts	7. During construction, lead to reductions in the quality of potable water supplies or cause harm to fish and benthic communities, due to the siltation of water-bodies?	☐	☐	☐
	8. Present a danger to local populations due to a significant scale of traffic, eg heavy lorries, high frequency, transport at night?	☐	☐	☐
	9. Create barriers to the movement of conservation-worthy wildlife or livestock?	☐	☐	☐
	10. Lead to a significant increase in congestion and related smog and noise?	☐	☐	☐
	11. Present a pollution risk to potable water supplies, or to surface water bodies that support conservation-worthy or commercially significant fish, due to accidents during the transport of hazardous materials?	☐	☐	☐
	12. Lead to unplanned settlement or access to conservation - worthy ecosystems or natural resources (eg agricultural land, timber, minerals, squatter settlements)?	☐	☐	☐
Mitigation Measures	13. Be likely to require mitigation measures that result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk...................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Port and Harbour Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or conversion of significant areas of land (eg > 50 ha rural, > 5 ha urban), or the utilisation of a significant length of coastline (eg > 1000m rural, > 200m urban)?	☐	☐	☐
	2. Require large volumes of construction materials to be taken from local sources (eg gravel, rock, water, by river dredging, quarrying)?	☐	☐	☐
	3. Result in significant quantities of eroded materials, domestic refuse, hazardous wastes, ship or shore effluent?	☐	☐	☐
	4. Require significant levels of accommodation and service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
	5. For port operations, require the establishment of on-site energy generation, accommodation, potable water supply or sanitation facilities?	☐	☐	☐
Receptors of Impacts	6. Be sited such that population resettlement or compensation is required?	☐	☐	☐
	7. Be sited close to areas of human settlement or tourism development?	☐	☐	☐
	8. Be sited in or near areas that support conservation-worthy or commercially valuable terrestrial or aquatic ecosystems, flora or fauna (eg protected areas, critical habitats, endangered species, mangrove forests, wetlands, lagoons, fisheries, breeding grounds); or in areas of historic/ cultural importance?	☐	☐	☐
Environmental Impacts	9. Change the way of life of the local population in such a way that it leads to considerable increased pressure on the natural resource base (eg fish stocks, agricultural land, potable water supplies)?	☐	☐	☐
	10. Present a significant pollution risk to humans, conservation-worthy ecosystems or species, or commercial fish stocks due to: • wastewater (bilge) discharge from ships? • wastewater discharge on shore (eg industrial or sewage)? • the depositing on land or at sea of dredged spoil? • the storage and loading of hazardous cargo?	☐	☐	☐
Mitigation Measures	11. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk....................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Energy Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or conversion of significant areas of land for energy production, fuel storage, waste treatment, or waste disposal (eg > 50 ha)?	☐	☐	☐
	2. Result in significant quantities of eroded material, liquid or solid wastes, or emissions?	☐	☐	☐
	3. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
	4. Require significant volumes of water to operate (significance dependent upon availability of water supplies)?	☐	☐	☐
Receptors of Impacts	5. Require the siting of facilities such that nearby settlements (eg upwind) may be affected by gaseous emissions?	☐	☐	☐
	6. Require the resettlement or compensation of local people?	☐	☐	☐
	7. Require the construction of facilities (including transmission lines and transport access routes) in areas that support conservation-worthy ecosystems, flora or fauna (eg protected areas, wilderness areas, critical habitats, endangered species); or sites of historical or cultural importance?	☐	☐	☐
Environmental Impacts	8. Present a significant risk of pollution due to effluent discharge, or solid waste deposit, into or nearby the extraction source of potable water supplies, or water-bodies that support conservation-worthy aquatic ecosystems or commercially significant fish?	☐	☐	☐
	9. Present a significant air quality pollution risk to humans?	☐	☐	☐
	10 Lead to a higher rate of use of renewable resources than the rate of natural replenishment (eg surface and ground water, fuelwood, water-body waste absorption capacity)?	☐	☐	☐
Mitigation Measures	11 Be likely to require mitigation measures that may result in the project being financially or socially unacceptable (eg Flue-Gas De-sulphurisation facilities (FGD), low sulphur coal)?	☐	☐	☐
Comments				

I recommend that the programme be assigned to Category ☐

Signature: Delegation......................................Desk.................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Agriculture Projects (Irrigation, see Checklist 8)

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the landuse conversion of significant areas of land (eg > 100 hectares)?	☐	☐	☐
	2. Require the mechanised clearing or levelling of large areas of land (eg > 50 hectares), or of land that is significantly sloping (eg > 5%)?	☐	☐	☐
	3. Require significant use of fertilisers or pesticides (significance dependent upon chemical type, application volumes/rates, users' experience)?	☐	☐	☐
	4. Require accommodation, service amenities or farm land to support agricultural labourers (eg > 100 labourers)?	☐	☐	☐
	5. Require an increase in agro-processing capacity (eg > 25%)?	☐	☐	☐
Receptors of Impacts	6. Convert land that supports conservation-worthy ecosystems, flora or fauna (eg tropical forest, wilderness areas, critical habitats, endangered species); or areas that are of historical or cultural importance?	☐	☐	☐
	7. Conflict with existing land uses, use of potable water supplies, labour demands?	☐	☐	☐
Environmental Impacts	8. Lead to soil erosion, soil degradation, falling crop yields etc. due to incompatibility between land suitability and land management practices?	☐	☐	☐
	9. Cause people significantly to alter the method by which they sustain their livelihood (significance dependent upon scale and type of socio-economic impact, eg willingness to change, unequal benefits)?	☐	☐	☐
	10. Present a risk of pollution, due to pesticide or fertiliser runoff, to water bodies that support conservation-worthy ecosystems or species, or commercially significant fish stocks?	☐	☐	☐
	11. Induce unplanned development through the construction of access or feeder roads?	☐	☐	☐
Mitigation Measures	12. Require significant extension services to establish or sustain the project (eg long-term > two years, intensive training)?	☐	☐	☐
	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Irrigation Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the conversion of significantly large areas of land (eg > 250 hectares)?	☐	☐	☐
	2. Require the construction of a supply reservoir, or require the significant extraction of surface or ground water supplies (eg > 100 ha of irrigated land from surface waters, > 200 ha from groundwater)?	☐	☐	☐
	3. Require the mechanised clearing or levelling of a significant area of land (eg > 50 ha)?	☐	☐	☐
	4. Require a significant increase in the use of fertilisers or pesticides (significance dependent upon the nature of crop, chemical type, application volumes/rates, users' experience)?	☐	☐	☐
Receptors of Impacts	5. Conflict with downstream extraction of water for agriculture/irrigation or human settlement; or with the utilisation of surface water-bodies (eg rivers, lakes, freshwater lagoons) by conservation-worthy aquatic ecosystems and species or commercially significant fish?	☐	☐	☐
	6. Conflict with the downstream wastewater absorption capacities of surface water-bodies?	☐	☐	☐
Environmental Impacts	7. Lead to an increase in the incidence of water-borne or water- related diseases (dependent upon incidence of disease vectors, irrigation management practices, proximity to settlement etc.) ?	☐	☐	☐
	8. Lead to significant waterlogging or salinisation of soils (significance dependent upon soil type, crop tolerance, management practices, drainage capacity)?	☐	☐	☐
	9. Cause people to alter greatly the method by which they sustain their livelihood?	☐	☐	☐
Mitigation Measures	10. Require significant extension services and training to establish or sustain the project (eg long-term > 2 years, intensive training and regulation of water extraction and use, agro-chemical inputs, wastewaters, pests and diseases)?	☐	☐	☐
	11. Be likely to require mitigation measures that are on a financial scale such that the programme or project may be impeded?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation.......................................Desk.................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Forestry Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the protection, exploitation or conversion of significant areas of forest (eg > 50 hectares)?	☐	☐	☐
	2. Introduce tree species of which there is little experience by those who will manage production in the long-term?	☐	☐	☐
	3. Require a significant increase in forestry processing (eg saw mills, paper and pulp facilities increased capacities, eg by > 25%)?	☐	☐	☐
Receptors of Impacts	4. Require population resettlement or compensation?	☐	☐	☐
	5. Exploit or convert forested areas that support conservation worthy ecosystems (eg protected areas, critical habitats, endangered species); or that contain sites of historical or cultural importance?	☐	☐	☐
	6. Conflict with existing uses for forested areas (eg fuelwood, forest products; wildlife, wildlife habitats)?	☐	☐	☐
	7. Displace the activities of local populations such that there is pressure on natural resources surrounding the project area (eg on soil, wildlife, potable water supplies, water-body waste absorption capacities, fish)?	☐	☐	☐
Environmental Impacts	8. Cause people significantly to alter the method by which they sustain their livelihood (significance dependent upon scale and type of socio-economic impact, eg inertia to change, unequal benefits)?	☐	☐	☐
	9. Be likely to lead to unplanned agricultural settlement due to the construction of access roads to the project area?	☐	☐	☐
	10. Significantly alter the flow regime of the local watershed (significance dependent upon type of operation, evapotranspiration characteristics of tree species, disturbance to drainage network)?	☐	☐	☐
Mitigation Measures	11. Require the long-term provision of forestry management extension services to establish or sustain the project (eg > 2 years)?	☐	☐	☐
	12. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Fisheries and Aquaculture Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. For aquaculture, require the introduction of species for which there is little ecological experience in the project area?	☐	☐	☐
	2. Require a significant increase in extraction of water, or demand for energy supplies (eg > 10% of local supply)?	☐	☐	☐
	3. Require a significant increase in the provision of fish processing facilities (eg > 25%)?	☐	☐	☐
	4. Use fish-capture technologies that may significantly affect the fish species mix?	☐	☐	☐
Receptors of Impacts	5. Conflict with the income generating activities of those unconnected with the project particularly those exploiting part of the same fisheries resource?	☐	☐	☐
	6. For aquaculture, conflict with the current use of surface or groundwater sources for agriculture/irrigation, livestock or human settlements?	☐	☐	☐
	7. Be based on a significant increase in the exploitation of conservation-worthy ecosystems, such as mangrove forests, coral reefs, or as found in lakes, lagoons or rivers (significance dependent upon carrying capacities)?	☐	☐	☐
Environmental Impacts	8. Result in the catching of species that are worthy of protection?	☐	☐	☐
	9. Cause people significantly to alter the method by which they sustain their livelihood (significance dependent upon scale and type of socio-economic impact, eg inertia to change, unequal benefits)?	☐	☐	☐
	10. Present a pollution risk to other commercial fish or conservation-worthy species?	☐	☐	☐
	11. Cause a long-term change in fish species mix affecting the sustainability of fish yields?	☐	☐	☐
Mitigation Measures	12. Require significant extension services or training to establish or sustain the project (eg long-term > 2 years; intensive training; regulation of catches, extraction of water, chemical and feed inputs, or wastewaters)?	☐	☐	☐
	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Livestock Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the landuse conversion of a significant area of land (eg > 250 hectares)?	☐	☐	☐
	2. Require the clearing of forested areas (eg > 50 hectares)?	☐	☐	☐
	3. Involve significant numbers of livestock (large-scale intensive/ rangeland rearing - significance dependent upon land carrying capacity and livestock management practices; small-scale intensive rearing - eg installations with > 50 heads cattle, 500 poultry, 100 pigs)?	☐	☐	☐
	4. Generate significant quantities of animal dung (eg small-scale intensive rearing only: installations with > 50 heads cattle, 500 poultry, 100 pigs)?	☐	☐	☐
	5. Require a significant increase in the provision of livestock processing facilities (eg > 25%)?	☐	☐	☐
Receptors of Impacts	6. Be located in areas that support conservation-worthy ecosystems, flora or fauna (eg tropical forests, wilderness areas, critical habitats, endangered species); or areas that are of historical or cultural importance?	☐	☐	☐
	7. Conflict with existing land tenure rights, land uses, or downstream water extraction?	☐	☐	☐
	8. Displace the activities of those unconnected with the project causing greater pressure on surrounding natural resources?	☐	☐	☐
Environmental Impacts	9. Lead to the denuding of natural vegetation and erosion of soil due to incompatibility between land suitability and livestock management practices (eg utilisation of marginal areas, overstocking)?	☐	☐	☐
	10. Increase the risk of communicable diseases, between livestock, and from livestock to humans (eg bacteria, viruses, internal/external parasites)?	☐	☐	☐
	11. Present a pollution risk to potable water supplies, conservation- worthy aquatic fauna, or commercial fish stocks (contaminants include urine, dung, suspended sediment in water sources, rangeland fertilizers)?	☐	☐	☐
Mitigation Measures	12. Require the provision of significant extension services to establish or sustain the project (eg long-term > 2 years, intensive training)?	☐	☐	☐
	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk....................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Mining and On-site Mineral Processing Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the conversion of significant areas of land for surface excavations, mineral processing or waste disposal (eg > 20 ha)?	☐	☐	☐
	2. Require significant accommodation or service amenities to support the workforce (eg > 100 manual workers)?	☐	☐	☐
	3. Require significant volumes of local raw materials, water or energy (significance dependent on availability, conflict with other users, sensitivity of operation, eg stream dredging for gravel)?	☐	☐	☐
	4. Result in significant quantities of construction or mining wastes, or eroded material (significance dependent upon waste types, rainfall)?	☐	☐	☐
Receptors of Impacts	5. Undertake excavation, mineral processing, waste disposal, or construction of transport infrastructure, in areas that support conservation-worthy ecosystems, flora or fauna (eg protected areas, wilderness areas, critical habitats, endangered species); or areas of historical or cultural importance?	☐	☐	☐
	6. Require the resettlement or compensation of local people?	☐	☐	☐
	7. Undertake surface or underground mining in areas prone to high flood recurrence?	☐	☐	☐
Environmental Impacts	8. Present a pollution risk to the workforce, human settlements, terrestrial or aquatic conservation-worthy ecosystems, flora and fauna, or commercial species due to: • discharge of mining waste waters? • excessive noise or vibration? • deposit and subsequent leaching of contaminated spoil? • emission of polluting gases and particulates from processing? • accidents from the use or transport of hazardous materials?	☐	☐	☐
	9. Induce secondary development (eg along access roads, agricultural settlements, mineral prospecting, entrepreneurial services for workforce)?	☐	☐	☐
Mitigation Measures	10. Require significant levels of management and training to establish or sustain the project (eg long-term > 2 years; intensive training; health and safety compliance; regulation of hazardous materials, wastewaters)?	☐	☐	☐
	11. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐
Comments				
	I recommend that the programme be assigned to Category	☐		
	Signature: Delegation.................................... Desk....................................			

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Industry Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or conversion of significant areas of land for industrial production, storage or waste disposal (eg > 20 ha rural, > 5 ha urban)?	☐	☐	☐
	2. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?			
	3. Require significant volumes of local raw materials, water or energy (significance dependent on availability and conflict with other users)?	☐	☐	☐
	4. Result in significant quantities of eroded material, solid or liquid industrial wastes or emissions?	☐	☐	☐
Receptors of Impacts	5. Locate industrial plants, waste treatment facilities, disposal sites or transport infrastructure, in areas that support conservation-worthy ecosystems, flora or fauna (eg protected areas, wilderness areas, critical habitats, endangered species); or sites of historical or cultural importance?	☐	☐	☐
	6. Require the resettlement or compensation of local people?	☐	☐	☐
Environmental Impacts	7. Present a significant pollution risk to humans, conservation-worthy ecosystems or species, or commercially significant fish stocks due to: • discharge of contaminated industrial effluent? • discharge of cooling waters? • deposit and leaching of contaminated solid industrial wastes? • emission of polluting gases and particulates? • accidents from the use or transport of hazardous materials?	☐	☐	☐
Mitigation Measures	8. Require significant training to establish or sustain the project (eg long-term > 2 years; intensive training; health and safety compliance; regulation of water extraction, hazardous materials, effluent, liquid and solid wastes)?	☐	☐	☐
	9. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation......................................Desk.................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Tourism Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or conversion of significant areas of land for accommodation or infrastructure, eg potable water supplies, waste treatment and disposal, energy supplies (> 50 ha rural, > 5 ha urban; or > 1000 m coastline rural, > 200 m urban)?	☐	☐	☐
	2. During construction of facilities, result in significant quantities of wastes or eroded material (significance dependent upon waste types, season of heavy rainfall)?	☐	☐	☐
	3. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
	4. Once operational, result in the generation of significant quantities of domestic refuge or sewage?	☐	☐	☐
Receptors of Impacts	5. Locate facilities, or route infrastructure, in areas that support terrestrial or aquatic conservation-worthy ecosystems, flora or fauna (eg forests, wetlands, protected areas, mangrove forests, lagoons, critical habitats, endangered species); or areas that are of historical or cultural importance?	☐	☐	☐
	6. Conflict with existing land uses, extraction of water, downstream users of water-bodies to absorb wastes, use of energy supplies, local wage labour?	☐	☐	☐
Environmental Impacts	7. Lead to physical damage to conservation-worthy terrestrial or aquatic ecosystems, flora and fauna, due to the type of tourism activity or excessive tourist numbers?	☐	☐	☐
	8. Due to domestic refuse and sewage, present a significant risk of pollution to potable water supplies or inland water bodies/marine environments that support conservation-worthy ecosystems/species or commercial fish stocks?	☐	☐	☐
	9. Cause local people significantly to alter the method by which they sustain their livelihood (significance dependent upon scale and type of socio-economic impact, eg inertia to change, unequal benefits)?	☐	☐	☐
	10. Lead to a boom-bust tourism scenario that may leave the local environment permanently damaged and a declining income opportunity?	☐	☐	☐
Mitigation Measures	11. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation...Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Resettlement Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or conversion of a significantly large area of land (eg rural > 250 hectares)?	☐	☐	☐
	2. Be located in physical environments alien to the settler population (eg slope, soil type, rainfall pattern, local climate, market access etc)?	☐	☐	☐
	3. Require the construction and operation of infrastructure (eg water supply, waste treatment and disposal facilities, energy supply, education and health facilities)?	☐	☐	☐
Receptors of Impacts	4. Introduce an incompatible culture to the existing population?	☐	☐	☐
	5. Convert land that supports conservation-worthy ecosystems, flora or fauna (eg tropical forest, forest reserves, wilderness areas, critical habitats or endangered species); or areas that are of historical or cultural importance?	☐	☐	☐
	6. Be located in areas that currently support a significantly large local population (significance dependent upon land carrying capacity, ratio of settlers to host population etc.)?	☐	☐	☐
	7. Conflict with existing land uses, extraction of water, downstream users of water-bodies to absorb wastes, use of energy supplies, local wage labour?	☐	☐	☐
Environmental Impacts	8. Cause people significantly to alter the method by which they sustain their livelihood (significance dependent upon scale and type of socio-economic impact)?	☐	☐	☐
	9. Lead to an unequal provision of amenities and services in favour of settlers over the host population?	☐	☐	☐
	10. Attract unplanned settlements/squatters?	☐	☐	☐
	11. Lead to social conflict between settler and host populations?	☐	☐	☐
Mitigation Measures	12. Ensure that compensation includes the provision of long-term livelihood security for settlers, including the needs of an expanding population?	☐	☐	☐
	13. Require significant extension services and training to establish or sustain the project (eg long-term > 2 years, intensive training)?	☐	☐	☐
	14. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Checklist for Pesticides and Fertiliser Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the application of highly toxic, non-biodegradable particularly broad-spectrum chemical pesticides?	☐	☐	☐
	2. Involve application methods for pesticides or fertilisers which use either relatively unfocused means of application (aerial spraying) or chemicals in high concentrations (eg Ultra-Low Volume) or volumes?	☐	☐	☐
Receptors of Impacts	3. Require the handling and application of chemicals by inexperienced users?	☐	☐	☐
	4. Directly or indirectly, affect areas that support terrestrial or aquatic conservation-worthy eco-systems, flora or fauna (eg forests, wetlands, protected areas, mangroves, lagoons, critical habitats endangered species)?	☐	☐	☐
	5. Include areas prone to run-off of pesticides and fertilisers?	☐	☐	☐
	6. Have the potential of affecting human health, either by contaminating local surface and groundwater, by residues in food, or by directly affecting livestock, fish stocks and persons handling or applying pesticides?	☐	☐	☐
	7. Alter existing land use and water extraction patterns by increasing the productivity of agricultural lands?	☐	☐	☐
Environmental Impacts	8. Lead to the accumulation of toxic residues in the food chain?	☐	☐	☐
	9. Because of the types of chemicals used or through mode of application, lead to the emergence of new and/or more resistant pests?	☐	☐	☐
	10. Through run-off, contaminate wetlands, surface and groundwater bodies with pesticides, and/or fertilisers thereby disturbing aquatic and terrestrial ecology?	☐	☐	☐
	11. Through run-off, lead to the accumulation of fertilisers in surface water bodies, thereby leading to eutrophication?	☐	☐	☐
	12. Cause local people to significantly alter the method by which they sustain their livelihood (significance dependent upon scale and type of socio-economic impact, eg inertia to change, unequal benefits)?	☐	☐	☐
Mitigation Measures	13. Require significant extension services and training to establish or sustain the project (eg long-term >2 years, intensive training)?	☐	☐	☐
	14. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐

Comments

I recommend that the programme be assigned to Category ☐

Signature: Delegation..Desk..................................

Source: Directorate-General for Development Commission of the European Communities, 1993

Assessment Matrix: Wasterwater Disposal

	Environmental Effects / Development	Treatment Comminution Sedimentation Milliscreening Oxidation ponds Activated sludge Trickling filter Nutrient removal Chlorination Further treatment offsite	Disposal - Land Rapid infiltration Surface flooding Spray irrigation Disposal - Inland Water River Lake Disposal - Marine Water Estuary Inshore marine Offshore marine Deep well injection
BIOLOGICAL ENVIRONMENT	Forest		
	Shrubland		
	Grassland		
	Herbfield (alpine)		
	Sand/shingle/rock		
	Cropland		
	Urban land		
	Lakes		
	Rivers		
	Estuaries		
	Inter-tidal		
	Marine		
	Wetlands		
PHYSICAL ENVIRONMENT	River regime		
	Erosion/land stability		
	Sedimentation		
	Surface water		
	Ground water		
	Agricultural soil		
	Foundation materials		
	Climate/atmosphere		
	Nuisance (noise, dust, smell)		
	Landform		
SOCIAL ENVIRONMENT	Public participation		
	Employment		
	Settlement		
	Land value		
	Existing land uses		
	Risks and anxieties		
	Personal and social values		
	Historical/cultural		
	Landscape/visual		
	Recreation		

Source: Institution of Engineers Australia 1989

Assessment Matrix: Site Development

	Environmental Effects / Development	Foundations Earthworks Water Supply . Treatment on site	Energy Supply on Site . Electricity . Gas . Oil . Other	Traffic . Construction . Other	Discharges . Gaseous . Liquid . Solid . Stormwater . Silt . Sewage
BIOLOGICAL ENVIRONMENT	Forest				
	Shrubland				
	Grassland				
	Herbfield (alpine)				
	Sand/shingle/rock				
	Cropland				
	Urban land				
	Lakes				
	Rivers				
	Estuaries				
	Inter-tidal				
	Marine				
	Wetlands				
PHYSICAL ENVIRONMENT	River regime				
	Erosion/land stability				
	Sedimentation				
	Surface water				
	Ground water				
	Agricultural soil				
	Foundation materials				
	Climate/atmosphere				
	Nuisance (noise, dust, smell)				
	Landform				
SOCIAL ENVIRONMENT	Public participation				
	Employment				
	Settlement				
	Land value				
	Existing land uses				
	Risks and anxieties				
	Personal and social values				
	Historical/cultural				
	Landscape/visual				
	Recreation				

Source: Institution of Engineers Australia 1989

Assessment Matrix: Transport and Services (Infrastructure)

	Environmental Effects / Development	Transport - People . Road . Rail . Air . Water	Transport - Materials . Road . Rail . Air . Water . Pipelines	Energy Supply - Transport to Site . Electricity . Gas . Oil . Other	Water Supply . Source . Transport Water Disposal . Liquid . Solid Communications Housing . Temporary . Permanent
BIOLOGICAL ENVIRONMENT	Forest				
	Shrubland				
	Grassland				
	Herbfield (alpine)				
	Sand/shingle/rock				
	Cropland				
	Urban land				
	Lakes				
	Rivers				
	Estuaries				
	Inter-tidal				
	Marine				
	Wetlands				
PHYSICAL ENVIRONMENT	River regime				
	Erosion/land stability				
	Sedimentation				
	Surface water				
	Ground water				
	Agricultural soil				
	Foundation materials				
	Climate/atmosphere				
	Nuisance (noise, dust, smell)				
	Landform				
SOCIAL ENVIRONMENT	Public participation				
	Employment				
	Settlement				
	Land value				
	Existing land uses				
	Risks and anxieties				
	Personal and social values				
	Historical/cultural				
	Landscape/visual				
	Recreation				

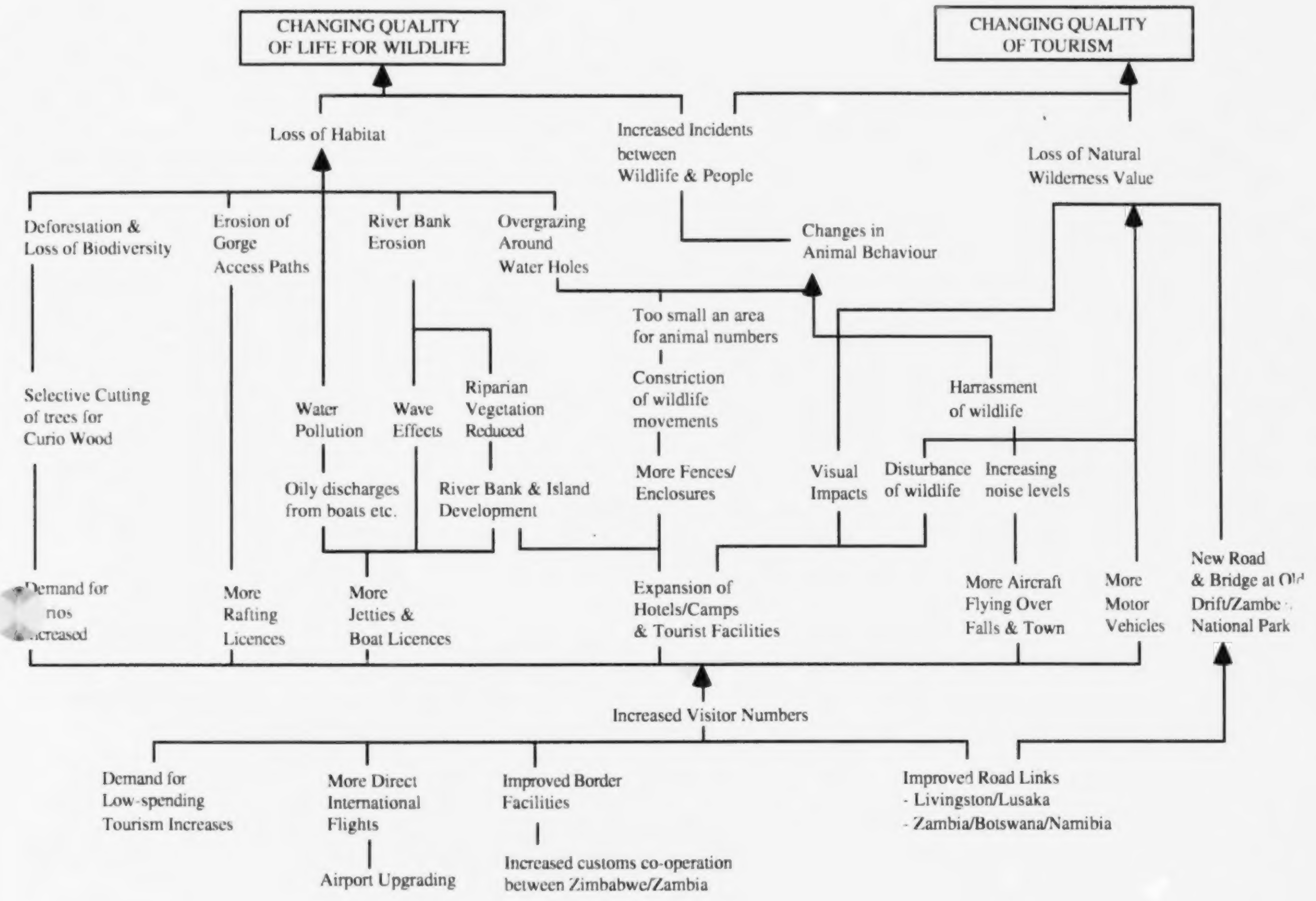
Source: Institution of Engineers Australia 1989

Assessment Matrix: Mining

	Environmental Effects Development	Exploration · Prospecting · Surveys · Drilling · Sampling	Opencast Mining · Overburden stripping · Blasting · Dewatering · Crushing Underground Mining · Methods used · Ventilation system · Dewatering Dredging · Floating plant · Pond formation	Ore Processing · Water supply · Washing plant · Process used · Stockpiling · Waste water treatment · Waste water disposal	Tailings · Tailings dam · Run-off control	Rehabilitation · Contour shaping · Planting · Overburden use	General · Surface infrastructure · Access roads · Energy source
BIOLOGICAL ENVIRONMENT	Forest						
	Shrubland						
	Grassland						
	Herbfield (alpine)						
	Sand/shingle/rock						
	Cropland						
	Urban land						
	Lakes						
	Rivers						
	Estuaries						
	Inter-tidal						
	Marine						
	Wetlands						
PHYSICAL ENVIRONMENT	River regime						
	Erosion/land stability						
	Sedimentation						
	Surface water						
	Ground water						
	Agricultural soil						
	Foundation materials						
	Climate/atmosphere						
	Nuisance (noise, dust, smell)						
	Landform						
SOCIAL ENVIRONMENT	Public participation						
	Employment						
	Settlement						
	Land value						
	Existing land uses						
	Risks and anxieties						
	Personal and social values						
	Historical/cultural						
	Landscape/visual						
	Recreation						

Source: Institution of Engineers Australia 1989

Network showing impact linkages leading to changes in quality of life, wildlife and tourism (arising from increased visitor numbers)


CHANGING QUALITY OF LIFE FOR WILDLIFE
CHANGING QUALITY OF TOURISM
Loss of Habitat
Increased Incidents between Wildlife & People
Loss of Natural Wilderness Value
Deforestation & Loss of Biodiversity
Erosion of Gorge Access Paths
River Bank Erosion
Overgrazing Around Water Holes
Changes in Animal Behaviour
Too small an area for animal numbers
Constriction of wildlife movements
More Fences/ Enclosures
Harrassment of wildlife
Selective Cutting of trees for Curio Wood
Water Pollution
Wave Effects
Riparian Vegetation Reduced
Oily discharges from boats etc.
River Bank & Island Development
Visual Impacts
Disturbance of wildlife
Increasing noise levels
Demand for nos ncreased
More Rafting Licences
More Jetties & Boat Licences
Expansion of Hotels/Camps & Tourist Facilities
More Aircraft Flying Over Falls & Town
More Motor Vehicles
New Road & Bridge at Ol Drift/Zambe National Park
Increased Visitor Numbers
Demand for Low-spending Tourism Increases
More Direct International Flights
Airport Upgrading
Improved Border Facilities
Increased customs co-operation between Zimbabwe/Zambia
Improved Road Links
- Livingston/Lusaka
- Zambia/Botswana/Namibia

(Source: Bisset personal communication)

Impact characteristic summary table

IMPACT CHARACTERISTIC	IMPACT TYPE		
	air quality	health	etc
nature			
magnitude			
extent/location			
timing			
duration			
reversibility			
likelihood (risk)			
significance			

ENVIRONMENTAL ASSESSMENT METHODOLOGIES

R.K. Jain, L.V. Urban, G.S. Stacey, H.E. Balbach

Environmental Assessment. McGraw-Hill. New York. Chapter 6.

Many methodologies have been developed which allow the user to respond in a substantive manner to NEPA regulations when preparing an EAIEIS document. Presented in this chapter is a review and analysis of some of these environmental assessment methodologies. The general categories of methodologies evolved quickly after the passage of NEPA, as researchers and practitioners sought to ensure that a "systematic, interdisciplinary approach" was used in preparing environmental documentation. The purpose of this discussion of assessment methodologies is: (1) to acquaint the reader with the different general types of methodologies, and (2) to provide illustrative examples of available methodologies in each category. An initial review and analysis of assessment methodologies was first completed by Warner and Preston (1974). The discussion here draws substantially from their work. Other approaches, such as multiattribute utility theory, systems diagrams, and simulation modeling, provide alternative ways of grouping assessment methodologies. Some of these methodologies were reviewed by Bisset (1988). The Further Readings section provides references to still other approaches and organizational methodologies which may be of interest.

1. CHOOSING A METHODOLOGY

Depending upon the specific needs of the user and the type of project being undertaken, one particular methodology may be more useful than another. Each individual must determine which tools best fit a given task. To select the most appropriate tools, the following key considerations may be useful.

Application

Is the analysis primarily a decision, an information, or a regulatory compliance document? (A decision document is vital for determining the best course of action, while an information document primarily reveals implications of the selected choices.) A decision document analysis generally requires greater emphasis on identification of key issues, quantification, and direct comparison of alternatives. An information document requires a more comprehensive analysis and concentrates on interpreting the significance of a broader spectrum of possible impacts. A study whose sole purpose is for regulatory compliance combines the two approaches.

Alternatives

Are alternatives fundamentally or incrementally different? If differences are fundamental (such as preventing flood damage by levee construction as opposed to flood plain zoning), then impact significance should be measured against some absolute standard, since impacts will differ in type as well as size. On the other hand, incrementally different alternative sets permit direct comparison of impacts and a greater degree of quantification. An example might be that of comparing the effects of a four-lane highway to those with six and eight lanes. There should always be a "no action" alternative, though in practice it is often hard to define. In some situations, especially those surrounding the *continuation* of an action, the no action alternative may be the one which brings about large changes in the status quo (i.e., the cessation of the activity). Many agencies have grappled with this paradox, with varying degrees of success. One must, as well, overcome the confusing public relations issues which arise when the no action alternative is the one which has the more severe consequences.

Public Involvement
Does the role of the public in the analysis involve substantive preparation of studies, especially those destined for public review? Substantive preparation allows use of more complex techniques, such as computer or statistical analysis that might be difficult to explain to a previously uninvolved but highly concerned public. A substantive preparation role will also allow a greater degree of quantification or weighting of impact significance through the direct incorporation of public values. Are regulatory agencies expected to have a high level of interest? If so, not only will detailed data likely be required, but the agency may require use of its models and criteria. The issue of managing public involvement will be separately examined in Chapter 9.

Resources
How much effort, skill, money, and data and what computer facilities are available? Generally, embarking on the more quantitative analyses will require more of everything, especially time. Many of the most complex EIS studies have required several years and more than 100 person-years of effort to complete. Is the project sponsor expecting that assessment of a multimillion dollar action may be completed in a few months and at a cost of less than $25,000? This is not likely to be the case, and realizing the magnitude of an effort prior to agency commitment rather than after work is supposed to begin may be vital to eventual success.

Time
Is there an announced project schedule? Have the officials in charge already announced a starting date? A completion date? Are they remotely realistic? Have they allocated at least the minimum preparation and processing times as presented in Chapter 4? All too often, though much less frequently in the 1990s than in the 1970s, the time for preparation of environmental documentation is severely underestimated—or omitted entirely.

Familiarity
Is the preparer familiar with both the type of action contemplated and the physical site? Greater familiarity will improve the validity of a more subjective analysis of impact significance. This is where the real value of the interdisciplinary team is seen. Together, they may exhibit knowledgeable oversight through understanding of both action and environment, whereas separately, only parts of the picture are clear.

Issue significance
How big is the issue being dealt with? All other things being equal, the bigger the issue, the greater the need to be explicit, to quantify, and to identify key issues. Arbitrary weights or formulae for trading off one type of impact (e.g., environmental) against another (e.g., economic) become less appropriate as the stakes increase.

Controversy
Are the activities known to be controversial? Certain types of actions are inherently controversial, or carry high potential to raise public ire and, in the U.S. tradition, congressional interest and involvement. Some past and present examples are nuclear power, hazardous waste disposal, highway routing, threats to endangered species, and closure of military installations. In some ways, treating such issues makes planning easier, because you know a smooth, rigid assessment process can be ruled out from the start. If the "quick and easy" route is acknowledged by all to be impossible, it is often easier to obtain agency support for more thorough presentations.

Administrative constraints

Are choices limited by agency procedural or format requirements? Specific agency policy or guidelines may rule out some tools by specifying the range of impacts to be addressed, the need for analyzing the tradeoffs, or the time frame of analysis. A programmatic EIS may require that all follow-on assessments will have a certain format, content, and methodology. Another aspect of constraint may be the cooperativeness of the planners and decision makers within your own agency. Are *they* willing to accept that the proposed action, or its time schedule, may need to be modified to accommodate environmental assessment activities or findings? The professional assessment staff, whether in-house or contracted, should be able to expect that two-way communication will be allowed. If not, this constraint should be identified as early as possible, and the anticipated problems associated with this lack of cooperation made known.

2. CATEGORIZING METHODOLOGIES

The various methodologies examined can be divided into six types, based upon the way impacts are identified.

Ad hoc

These methodologies provide minimal guidance for impact assessment beyond suggesting broad areas of possible impacts (e.g., impacts upon flora and fauna, lakes, and forests), rather than defining the specific parameters within the impact area which should be investigated. They may be effective when the preparers are unusually experienced in the type of action being examined and require only reminders.

Overlays

These methodologies rely upon a set of maps of a project area's environmental characteristics (physical, social, ecological, aesthetic). These maps are overlaid to produce a composite characterization of the regional environment. Impacts are identified by noting the congruence of inherently antagonistic environmental characteristics within the project boundaries. The Geographic Information System (GIS) is a modern development of this method.

Checklists

These methodologies present a specific list of environmental parameters to be investigated for possible impacts, *or* a list of agency activities known to have caused environmental concern. They may have considerable value when many repetitive actions are carried out under similar circumstances. They do not, in themselves, establish a direct cause-effect link, but merely suggest lines of examination. They may or may not include guidelines about how parameter data are to be measured and interpreted.

Matrices

The matrix methodologies incorporate both a list of project activities *and* a checklist of potentially impacted environmental characteristics. In a way, the matrix presents both alternatives from the checklist approach (i.e., both attributes and activities) to be considered simultaneously. The two lists are then related in a matrix which identifies cause-and-effect relationships between specific activities and impacts. Matrix methodologies may either specify which actions impact which environmental characteristics or may simply list the range of possible actions and characteristics in an open matrix to be completed by the analyst.

Networks

These methodologies work from a list of project activities to establish cause-condition-effect relationships. They are an attempt to recognize that a series of impacts may be triggered by a project action. Their approaches generally define a set of possible networks and allow the user to identify impacts by selecting and tracing out the appropriate project actions.

Combination computer-aided

These methodologies use a combination of matrices, networks, analytical models, and a computer-aided systematic approach to: (1) identify activities associated with implementing major federal programs, (2) identify potential environmental impacts at different user levels, (3) provide guidance for abatement and mitigation techniques, (4) provide analytical models to establish cause-effect relationships to quantitatively determine potential environmental impacts, and (5) provide a methodology and a procedure to utilize this comprehensive information in responding to requirements of EIS preparation.

3. REVIEW CRITERIA

To serve the purpose of NEPA, an environmental impact assessment must effectively deal with four key problems: (1) impact identification, (2) impact measurement, (3) impact interpretation, and (4) impact communication to information users.

Experience with impact assessments to date has shown that a set of evaluation criteria can be defined for each of these four key problems. These review criteria can be used for analyzing a methodology and determining its weaknesses and strengths. The criteria follow.

Impact identification

Comprehensiveness: A full range of direct and indirect impacts should be addressed, including ecological, physical-chemical pollution, social-cultural, aesthetic, resource supplies, induced growth, regional economy, employment, induced population or wealth redistributions, and induced energy or land-use patterns.

Specificity: A methodology should identify specific parameters (subcategories of impact types), i.e., detailed parameters under the major environmental categories of air, water, ecology, etc., to be examined.

Isolating project impacts: Methods to identify project impacts, as distinct from future environmental changes produced by other causes, should be required and suggested.

Timing and duration: Methods to identify the timing (short-term operational versus long-term operational phases) and duration of impacts should be required. (Data sources should also be listed for impact measurement and interpretation.)

Data sources: Identification of the data sources used to identify impacts should be required. (Data sources should also be listed for impact measurement and interpretation.)

Impact measurement

Explicit indicators: Specific measurable indicators to be used for quantifying impacts upon parameters should be suggested.

Magnitude: A methodology should require and provide for the measurement of impact magnitude, as distinct from impact significance.

Objectivity: Objective rather than subjective impact measurements should be emphasized. Professional judgements should be identified as such, although they may be the only criteria available in many cases.

Impact interpretation

Significance: Explicit assessment of the significance of measured impacts on a local, regional, and national scale should be required.

Explicit criteria: A statement of the criteria and assumptions employed to determine impact significance should be required.

Uncertainty: An assessment of the uncertainty or degree of confidence in impact significance should be required.

Risk: Identification of any impacts having low probability but high damage or loss potential should be required.

Alternatives comparison: A specific method for comparing alternatives, including the no project alternative, should be provided.

Aggregation: A methodology may provide a mechanism for aggregating impacts into a net total or composite estimate. If aggregation is included, specific weighting criteria or processes to be used should be identified. The appropriate degree of aggregation is a hotly debated issue on which no judgement can be made at this time.

Public involvement: A methodology should require and suggest a mechanism for public involvement in the interpretation of impact significance.

Impact communication

Affected parties: A mechanism for linking impacts to the specific affected geographical areas or social groups should be required and suggested.

Setting description: A methodology should require that the project setting be described to aid statement users in developing an adequate overall perspective.

Summary format: A format for presenting, in summary form, the results of the analysis should be provided.

Key issues: A format for highlighting key issues and impacts identified in the analysis should be provided.

NEPA compliance: Guidelines for summarizing results in terms of the specific points required by NEPA and subsequent CEQ regulations should be provided.

In addition to the above "content" criteria, methodological tools should be evaluated in terms of their resource requirements, replicability, and flexibility. The following considerations, used in arriving at the generalized ratings for these characteristics (shown in Table 6.1), may be useful when considering the appropriateness of other tools. Table 6.1 provides a framework for methodology evaluation.

Resource requirements

Data requirements: Does the methodology require data that are presently available at reasonable acquisition or retrieval cost?

Personnel requirements: What special skills are required? How many persons will be needed to implement the methodology? Do you have them available?

Time: How much time is required to learn to use and/or apply the methodology?

Costs: How do costs using a methodology compare to costs of using other tools?

Technologies: Are any specific technologies (e.g., use of a particular brand of computer) required to use a methodology?

Reliability

Replicability: Can the results be repeated given the same or similar conditions?

Ambiguity: What is the relative degree of ambiguity in the methodology? Does it measure what it says is measured?

Analyst bias: To what degree will different impact analysts using the methodology tend to produce widely different results? How much of the "methodology" is really subjective?

Flexibility

Scale flexibility: How applicable is the methodology to projects of widely different scale?

Range: For how broad a range of project or impact types is the methodology useful in its present form?

Adaptability: How readily can the methodology be modified to fit project situations other than those for which it was designed?

Comparison of methodologies: Methodologies may be rated for their degree of compliance with the 20 content criteria discussed above. Three rating characteristics on one possible rating scale are suggested as follows:

S = Substantial compliance, low resource needs, or few replicability-flexibility limitations

P = Partial compliance, moderate resource needs, or major limitations

N = No compliance or minimal compliance, high resource needs, or major limitations.

These ratings may be applied to various methodologies in order to choose one best-suited for a particular application. Table 6.1, a summary of methodology evaluation, can be completed as a practical exercise for the methodologies discussed herein or for other emerging methodologies.

4. METHODOLOGY DESCRIPTIONS

Nineteen methodologies or tools are examined here in detail. The brief description given for each methodology discusses some or all of the following points.

- Methodology type
- General approach used
- Range of actions or project types for which the methodology may be applicable
- Comprehensiveness of the methodology in terms of the range of impact addressed
- Resources required (data, labor, time, etc.)
- Limitations of the methodology (replicability, ambiguity, flexibility)
- Key ideas or particularly useful concepts
- Other major strengths and weaknesses as identified by the review criteria

Because of the brevity and subjectivity of these characterizations, they should not be considered fully adequate critiques of the tools examined. They may instead serve as a useful introduction to the range of techniques available. Many other methodologies, beyond those discussed here, are available for use by different agencies. The list of methodologies discussed here should not be considered exhaustive because of the dynamic nature of this subject area.

TABLE 6.1 Methodology Evaluation

Criteria	Methodology and Type																		
	Adkins (C)	Dee (1972) (C)	Dee (1973) (C-M)	Univ. of Georgia (C)	Jain/ Urban (CO)	Jain (1974) (M)	Krauskopf (O)	Leopold (M)	Little (C)	McHarg (O)	Moore (M)	Central NY Reg. Planning Board (M)	Smith (C)	Sorenson (NW)	Stover (C)	Bureau of Reclam. (C)	USACOE (C)	Walton (C)	Western Systems (A)
Comprehensiveness																			
Specificity																			
Isolate project impact																			
Timing and duration																			
Data sources known																			
Explicit indicators																			
Magnitude provided																			
Objective measurement																			
Significance scaled																			
Criteria explicit																			
Uncertainties made known																			
Risks identified																			
Alternatives compared																			
Impacts aggregated																			
Public involvement seen																			
Affected groups visible																			
Setting described																			
Format for summary																			
Key issues highlighted																			
Match NEPA regulations																			
Resource requirements																			
Reliability																			
Flexibility																			

Methodology Type Key:
A = Ad Hoc; C = Checklist; CO = Combination, computer-aided; M = Matrix; NW = Network; O = Overlay

Evaluation Symbols for Use in Scoring:
S = substantial compliance, low resource needs, or few reliability-flexibility limitations; P = partial compliance, moderate resource needs, or moderate limitations on reliability or flexibility; N = minimal or no compliance, high resource needs, or major limitations on reliability or flexibility; - = evaluation not attempted

5. METHODOLOGY REVIEW

***Interim Report: Social, Economic, and Environmental Factors in Highway Decision Making* (Adkins and Dock, 1971; Checklist).** This methodology is a checklist which uses a + 5 to - 5 rating system for evaluating impacts. The approach was developed to deal specifically with the evaluation of highway route alternatives. Because the bulk of parameters used relates directly to highway transportation, the approach may not be readily adaptable to other project types.

The parameters are broken down into categories of transportational, environmental, sociological, and economic impacts. Environmental parameters are generally deficient in ecological considerations. Social parameters emphasize community facilities and services.

Route alternatives are scored +5 to -5 in comparison with the present state of the project area, not the expected future state without the project.

Since the approach uses only subjective relative estimations of impacts, the data, labor, and cost requirements are very flexible. Reliance upon subjective ratings without guidelines for such ratings reduces the replicability of analysis and generally limits the valid use of the approach to a case-by-case comparison of alternatives only.

The detailed listing of social and, to a lesser extent, economic parameters may be helpful for identifying and cataloguing impacts for other types of projects. An interesting feature of possible value to other analyses using relative rating systems is the practice of summarizing the number and the magnitude of plus and minus ratings for each impact category. The number of pluses and minuses may be a more reliable indicator for alternative comparison, since it is less subject to the arbitrariness of subject weighting. These summaries are additive, and thus implicitly weight all impacts equally.

***Environmental Evaluation System for Water Resources Planning* (Dee et al., 1973; Checklist).** This methodology is a checklist procedure emphasizing quantitative impact assessment. While it was designed for water resource projects, most parameters used are also appropriate for other types of projects. Seventy-eight specific environmental parameters are defined within the four categories of ecology, environmental pollution, aesthetics, and human interest. The approach does not deal with economic or secondary impacts, and social impacts are partially covered within the human interest category.

Impacts are measured via specific indicators and formulae defined for each parameter. Parameter measurements are converted to a common base of "environmental quality units" through specified graphs or value functions. Impacts can be aggregated by using a set of preassigned weights.

Resource requirements are rather high, particularly data requirements. These requirements may restrict the use of the approach to major project assessments.

The approach emphasizes explicit procedures for impact measurement and evaluation and should therefore produce highly replicable results. Both spatial and temporal aspects of impacts are noted and explicitly weighted in the assessment. Public participation, uncertainty, and risk concepts are not dealt with. An important idea of the approach is the highlighting of key impacts via a "red flag" system.

***Planning Methodology for Water Quality Management: Environmental System* (Dee et al., 1973: Checklist/matrix).** This unique methodology of impact assessment defies ready classification, since it contains elements of checklist, matrix, and network approaches. Areas of possible impacts are defined by a hierarchical system of 4 categories (ecology, physical/chemical, aesthetic, social), 19 components, and 64 parameters. An interaction matrix is presented to indicate which activities associated with water quality treatment projects generally impact which parameters. The range of parameters used is comprehensive, excluding only economic variables.

Impact measurement incorporates two important elements. A set of "ranges" is specified for each parameter to express impact magnitude on a scale from 0 to 1. The ranges assigned to each parameter within a component are then combined by means of an "environmental assessment tree" into a summary environmental impact score for that component. The significance of impacts for each component is quantified by a set of assigned weights. A net impact can be obtained for any alternative by multiplying each component score by its weight factor and summing across components.

The key features of the methodology are its comprehensiveness, its explicitness in defining procedures for impact identification and scoring, and its flexibility in allowing use of best available data. Sections of the report explain the several uses of the methodology in an overall planning effort and discuss means of public participation. While the data, time, and cost requirements of the methodology when used for impact assessment are moderate, a small amount of training would be required to familiarize users with the techniques.

The methodology possesses only minor ambiguities and should be highly replicable. Because the environmental assessment "trees" are developed specifically for water-treatment facilities, the methodology cannot be readily adapted to other types of projects without reconstructing the "trees," although the parameters could be useful as a simple checklist.

One potentially significant obstacle to use of this approach is the difficulty of explaining the procedures to the public. Regardless of the validity of the "trees," they are devices developed by highly specialized multivariant-analysis techniques, and public acceptance of conclusions reached by their use may be low.

***Optimum Pathway Matrix Analysis Approach to the Environmental Decision-Making Process: Test Case: Relative Impact of Proposed Highway Alternatives* (University of Georgia, 1971; Checklist).** This methodology incorporates a checklist of 56 environmental components. Measurable indicators are specified for each component. The actual values of alternative plan impacts on a component are normalized and expressed as a decimal of the largest impact (on that one component). These normalized values are multiplied by a subjectively determined weighting factor. This factor is the sum of one times a weight for "initial" effects plus ten times a weight for "long-term" effects.

The methodology was developed to evaluate highway project alternatives, and the components listed are not suitable for other types of projects. The wide range of impact types analyzed include land use, social, aesthetics, and economic.

The potential lower replicability of the analysis produced by using subjectively determined weighting factors is compensated for by conducting the analysis over a series of iterations and incorporating stochastic error variation in both actual measurements and weights. This procedure provides a basis for testing the significance of differences in total impact scores between alternatives.

The procedures for normalizing or scaling measured impacts to obtain commensurability and testing of significant differences between alternatives are notable features of potential value to other impact analyses and methodologies. These ideas may be useful whenever several project alternatives can be identified and compared. This methodology may place rather high resource demands, because computerization is necessary to generate random errors and make the large number of repetitive calculations.

***Environmental Impact Assessment Study for Army Military Programs* (Jain et al., 1973) *and Computer-Aided Environmental Impact Analysis for Construction Activities: User Manual* (Urban et al., 1975; Combination computer-aided).** This is a computer-aided assessment system employing the matrix approach to identify potential environmental impacts. The system relates Army activities from nine functional areas to attributes contained in eleven technical areas of speciality describing the environment. The nine functional areas are construction, research and development, real estate acquisition or outleases of land, mission change, procurement, training administration and support, industrial activities, and operation and maintenance.

Three levels of attributes are identified: detailed level, review level, and controversial attributes. Ramification remarks regarding potential impacts are presented along with mitigation procedures for minimizing adverse impacts. Potential impacts are identified on a need-to-consider scale, using A, B, and C as indicators, instead of a numerical system.

Given the appropriate input information for a particular program, the computer-aided system developed will provide relevant environmental information to allow the user to respond to the requirements of CEQ guidelines. In addition, analytical models are being developed to quantitatively assess the environmental impacts. One such model, the Economic Impact Forecast System (EIFS), was operational at the time of publication (i.e., 1975).

Significant features of this methodology are: (1) it is cost-effective; (2) it provides analytical models for cause-effect relationships; (3) it is a comprehensive methodology; (4) the output matrix is modified, based upon site-specific input, to produce a project-specific input matrix; (5) it provides information regarding environmental laws and regulations; and (6) it includes information about abatement and mitigation techniques.

This methodology is designed for Army military programs. Its applicability to programs of other agencies is limited and would thus require some systematic modifications. Problems associated with effective community participation and evaluation of trade-off between short-term areas of environmental resources and long-term productivity are not adequately addressed.

***Handbook for Environmental Impact Analysis* (Jain et al. 1974; Matrix).** Employing an open-cell matrix approach, this handbook presents recommended procedures for use by Army personnel in the preparation and processing of environmental impact assessments and statements. The procedures outline an eight-step algorithm in which details of the proposed actions and associated alternatives are identified and evaluated for environmental effects in both the biophysical and socio-economic realms. Briefly, the procedural steps are outlined as follows:

1. Identify the need for an EA or an EIS.
2. Establish details of the proposed action.
3. Examine environmental attributes, impact analysis worksheets, and summary sheets.
4. Evaluate impacts, using attribute descriptor package.
5. Summarize impacts on summary sheet.
6. Examine alternatives.
7. Address the eight points of CEQ guidelines.
8. Process final document.

The handbook provides examples of representative Army actions that might have a significant environmental impact (step 1) and guidance on the identification of Army activities (steps 2 and 4) for Army functional areas.

Environmental attributes (steps 3 and 4) are identified and characterized. After evaluating the effect of the proposed action and the alternatives (step 6) on the interdisciplinary attributes, and summarizing the effects (step 5), it is recommended that the assessment be documented in the format suggested by the CEQ guidelines (step 7). Each of the eight points in the CEQ guidelines is discussed in detail, and Army-related examples are presented. (The guidelines were superseded in 1979 by the NEPA regulations, though much of the discussion is still relevant.) In addition, the handbook gives information regarding processing of assessments and statements (step 8).

Because the methodology is designed for Army military programs, its applicability to programs of other agencies is limited and would require systematic modifications. In addition, this methodology does not provide the depth and comprehensiveness of environmental information made available by the computer-aided study previously discussed.

Evaluation of Environmental Impact Through a Computer Modeling Process, Environmental Impact Analysis: Philosophy and Methods **(Krauskopf and Bunde, 1972; Overlay).** This methodology employs an overlay technique via computer mapping. Data on a large number of environmental characteristics are collected and stored in the computer on a grid system of 1-km square cells. Highway route alternatives can be evaluated by the computer (by noting the impacts on intersected cells), or new alternatives may be generated via a program identifying the route of least impact.

The environmental characteristics used are rather comprehensive, particularly regarding land use and physiographic characteristics. Although the methodology was developed and applied to a highway setting, it is adaptable (with relatively small changes in characteristics) to other project types with geographically well-defined and concentrated impacts. Because the approach requires considerable amounts of data about the project region, it may be impractical for the analysis of programs of broad geographical scope. The labor skill, money, and computer technology requirements of the approach may limit its application to major projects or to situations where a statewide computer data base exists (e.g., New York, Minnesota, Iowa). The 1-km resolution would be considered unacceptable today. The Geographic Information System, a successor to the overlay, may use 20- to 100-m resolution for similar purposes.

Impact importance is estimated through the specification of subjective weights. Because the approach is computerized, the effects of several alternative weighting schemes can be readily analyzed.

The methodology is attractive from several viewpoints. It allows a demonstration of which weighted characteristics are central to a particular alternative route; it presents a readily understandable graphic representation of impacts and alternatives; it easily handles several subjective weighting systems; its incremental costs of considering or generating additional alternatives are low; and it fits well with developing regional and statewide data bank systems.

The mechanics of the approach (how impacts are measured and combined) may not be readily apparent from the reference cited. Considerable training beyond the information available in this reference may be required prior to using the approach.

***A Procedure for Evaluating Environmental Impact* (Leopold et al., 1971; Matrix).** This is an open-cell matrix approach identifying 100 project activities and 88 environmental characteristics or conditions. For each action involved in a project, the analyst evaluates the impact on every environmental characteristic in terms of impact magnitude and significance. These evaluations are subjectively determined by the analyst. Ecological and physical-chemical impacts are treated comprehensively; social and indirect impacts are discussed in part; and economic and secondary impacts are not addressed.

Because the assessments are subjective, resource requirements of the approach are very flexible. The approach was not developed in reference to any specific type of project and was very widely applied in the 1970s, usually with some local alterations.

Guidelines for use of the approach are minimal, and several important ambiguities are likely in the definition and separation of impacts. The reliance upon subjective judgement, again, without guidelines, reduces the replicability of the approach.

The approach is chiefly valuable as a means of identifying project impacts and as a display format for communicating results of an analysis.

***Transportation and Environment: Synthesis for Action: Impact of National Environmental Policy Act of 1969 on the Department of Transportation* (DOT,1969;Checklist).** This approach is basically an overview discussion of the kinds of impacts that may be expected to occur from highway projects, and the measurement techniques that may be available to handle some of them. A comprehensive list of impact types and the stages of project development at which each may occur is presented. As broad categories, the impact types identified are useful for other projects as well as highways.

The approach suggests the separate consideration of an impact's amount, effect (public response), and value. Some suggestions are offered for measuring the amount of impact within each of seven general categories: noise, air quality, water quality, soil erosion, ecological, economic, and socio-political impacts.

Five possible approaches to handling impact significance are presented. Three of these are "passive" (requiring no agency action), such as "reliance upon the emergence of controversy." The other two involve the use of crude subjective weighting scales. No specific suggestions are made for the aggregation of impacts either within or between categories.

In general, the reference cited is a useful discussion of some of the important issues of impact analysis, particularly as they apply to transportation projects; however, it does not present a complete analytical technique.

***A Comprehensive Highway Route-Selection Method, and Design with Nature* (McHarg, 1968 and 1969; Overlay).** This approach employs transparencies of environmental characteristics overlaid on a regional base map. Eleven to sixteen environmental and land-use characteristics are mapped. The maps represent three levels of the characteristics, based upon "compatibility with the highway." While these references do not indicate how this compatibility is to be determined, available documentation is cited.

This approach is basically an earlier, noncomputerized version of the ideas presented in Krauskopf (1972). Its basic value is a method for screening alternative project sites or routes. Within this particular use, it is applicable to a variety of project types. Limitations of the approach include its inability to quantify and identify possible impacts and its implicit weighting of all characteristics mapped.

Resource requirements of this approach are somewhat less demanding in terms of data than those of the Krauskopf approach, because information is not directly quantified, but rather, categorized into three levels. However, high degrees of skill and training are required to prepare the map overlays.

The approach seems most useful as a "first-cut method" of identifying and sifting out alternative project sites prior to preparing a detailed impact analysis. Historically, McHarg was the primary popularizer of the concept of "compatibility" in planning major development projects. His background led him to a visual rather than a mathematical representation of "incompatible" elements, but most or all of his elements correspond to environmental problems, such as noise, soil loss, and ecological disturbance.

A Methodology for Evaluating Manufacturing Environmental Impact Statements for Delaware's Coastal Zone **(Moore et al., 1973; Matrix).** This approach was not designed for impact analysis, although its principles could be adapted for such use. Employing a network approach, it links a list of manufacturing-related activities to potential environmental alterations, major environmental effects, and finally, to human uses affected. The primary strength of the set of linked matrices is their utility for displaying cause-condition-effect networks and tracing out secondary impact chains.

Such networks are useful primarily for identifying impacts. The issues of impact magnitude and significance are addressed only in terms of high, moderate, low, or negligible damage. As a result of these subjective evaluations, the approach would have low replicability as an assessment technique. For such a use, guidelines would likely be needed to define the evaluation categories.

The approach incorporates indicators especially tailored to manufacturing facilities in a coastal zone, although most indicators would also be pertinent to other types of projects. It would perhaps be valuable as a visual summary of an impact analysis for communication to the public.

Environmental Resources Management **(Central NY Reg. Planning Board, 1972; Matrix).** This methodology employs a matrix approach to assess in simple terms the major and minor, direct and indirect impacts of certain water-related construction activities. It is designed primarily to measure only the physical impacts of water-resource projects in a watershed and is based upon an identification of the specific, small-scale component activities that are included in a project of any size. Restricted to physical impacts for nine types of watershed areas (e.g., wetlands) and fourteen types of activities (e.g., tree removal), the procedure indicates four possible levels of impact-receptor interaction (major direct through minor indirect).

Low to moderate resources, in terms of time, money, and personnel, are required for this methodology, due principally to its simple method of quantification (major versus minor impact). However, the procedure is severely limited in its ability to compare different projects or the magnitude of different impacts.

Since there is no spatial or temporal differentiation, the full range of impacts cannot be readily assessed. Impact uncertainty and highdamage/low-probability impacts are not considered. Since only two levels of impact magnitude are identified, and the importance of the impacts is not assessed, moderate replicability results. The lack of objective evaluation criteria may produce fairly ambiguous results. NEPA requirements for impact assessments are not directly met by this procedure.

This methodology may be less valuable for actual assessment of the quantitative impacts of a potential project than for the "capability rating system," which determines recommended development policies on the basis of existing land characteristics. Thus, guidelines for desirable and undesirable activities, with respect to the nine types of watershed areas, are used to map a region in terms of the optimum landuse plan. The actual mapping procedure is not described; therefore, that aspect of the impact assessment methodology cannot be evaluated here.

Quantifying the Environmental Impact of Transportation Systems **(W. L Smith; Checklist).** This approach, as developed for highway route selection, is a checklist system based upon the concepts of probability and supply and demand. The approach attempts to identify the alternative with least social cost to environmental resources and maximum social benefit to system resources. Environmental resources elements are listed as agriculture, wildlife conservation, interference noise, physical features, and replacement. System resources elements are listed as aesthetics, cost, mode interface, and travel desired. Categories are defined for each element and used to classify zones of the project area. Numerical probabilities of supply and demand are then assigned to each zone for each element. These are multiplied to produce a "probability of least social cost" (or maximum social benefit). These "least social cost" probabilities are then multiplied across the elements to produce a total for the route alternative under examination.

The approach is tailored and perhaps limited to project situations requiring comparison of siting alternatives. While the range of environmental factors examined is limited, it presumably could be expanded to more adequately cover ecological, pollution, and social considerations.

Since procedures for determining supply and demand probabilities are not described, it is difficult to anticipate the amounts of data, labor, and money required to use the approach. The primary limitations of this methodology are the difficulties inherent in assigning probabilities, particularly demand probabilities, and the implicitly equal weightings assigned each element when multiplying to yield an aggregate score for an alternative.

A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone **(Sorenson 1970) and** ***Procedures for Regional Clearinghouse Review of Environmental Impact Statements—Phase Two*** **(Sorenson and Pepper, 1973; Network).** These two publications present a network approach usable for environmental impact analysis. The approach is not a full methodology but rather a guide to identifying impacts. Several potential uses of the California coastal zone are examined through networks relating uses to causal factors (project activities), to first-order condition changes, to second- and third-order condition changes, and finally, to effects. A major strength of the approach is its ability to identify the pathways by which both primary and secondary environmental impacts are produced.

The second reference also includes data types relevant to each identified resource degradation element, although no specific measurable indicators are suggested. In this reference, some general criteria suggested for identifying projects of regional significance are based upon project size and types of impacts generated, particularly land-use impacts.

Because the preparation of the required detailed networks is a major undertaking, the approach is presently limited to some commercial, residential, and transportation uses of the California coastal zone for which networks have been prepared. An agency wishing to use the approach in other circumstances might develop the appropriate reference networks for subsequent environmental impact assessment. This is one of many examples of a special-purpose tool constructed for a repetitively applied function. Such a tool may be excellent for its original purpose while only mediocre for generalized use.

***Environmental Impact Assessment: A Procedure* (Stover, 1972; Checklist).** This methodology is a checklist procedure for a general quantitative evaluation of environmental impacts from development activities. The type and range of these activities is not specified but is believed to be comprehensive. The 50 impact parameters are sufficient to include nearly all possible effects and thereby allow much flexibility. Subparameters indicate specific impacts, but there is no indication of how the individual measures are aggregated into a single parameter value. While spatial differences in impacts are not indicated, both initial and future impacts are included and explicitly compared.

The moderate to heavy resource requirement, especially in terms of an interdisciplinary personnel team, increases as more subparameters are included and require additional expertise in specific areas. However, the actual measurements are not based on specific criteria and are only partially quantitative, having seven possible values ranging from an extremely beneficial impact to an extremely detrimental one. Therefore, there may be room for ambiguous and subjective results with only moderate replicability.

The assumption that impact areas are implicitly of equal importance allows aggregation of the results and project comparisons, but at the expense of realism. A specific methodology is mentioned for choosing the optimum alternatives in terms of the proportional significance of an impact vis-a-vis other potential alternatives. There is no explicit mention of either public involvement in the process or environmental risks.

The impact assessment procedure is presented as only one step in a total evaluation scheme, which includes concepts of dynamic ecological stability and other ideas. An actual description of the entire process is not indicated, however.

***Guidelines for Implementing Principles and Standards for Multiobjective Planning of Water Resources* (Bureau of Reclamation, 1972; Checklist).** This approach is an attempt to coordinate features of the Water Resources Council's Proposed Principles and Standards for Planning Water and Related Land Resources with requirements of NEPA. It develops a checklist of environmental components and categories organized in the same manner as the WRC guidelines. The categories of potential impacts deal comprehensively with biological, physical, cultural, and historical resources, and pollution factors, but do not treat social or economic impacts. Impacts are measured in quantitative terms wherever possible, and also rated subjectively on "quality" and "human influence" bases. In addition, uniqueness and irreversibility considerations are included where appropriate. Several suggestions for summary tables and bar graphs are offered as communications aids.

The approach is general enough to be widely applicable to various types of projects, although its impact categories are perhaps better tailored to rural than urban environments. While no specific data or other resources are required to conduct an analysis, an interdisciplinary project team is specified to assign the subjective weightings. Since quality, human influence, uniqueness, and irreversibilities are all subjectively rated by general considerations, results produced by the approach may be highly variable. Significant ambiguities include a generally inadequate explanation of how human influence impacts are to be rated and interpreted.

Key ideas incorporated in the approach include explicit identification of the "without project" environment as distinct from present conditions, and a uniqueness rating system for evaluating quality and human influence (worst known, average, best known). The methodology is unique among those examined, because it does not label impacts as environmental benefits or costs, but only as impacts to be valued by others. The approach also argues against the aggregation of impacts.

Matrix Analysis of Alternatives for Water Resource Development **(USACOE, 1972; Checklist)**. Despite the title, this methodology can be considered to be a checklist under the definitions used here. Although a display matrix is used to summarize and compare the impacts of project alternatives, impacts are not linked to specific project actions. The approach was developed to deal specifically with reservoir construction projects but could be readily adapted to other project types.

Potential impacts are identified within three broad objectives: environmental quality, human life quality, and economics. For each impact type identified, a series of factors is described to show possible measurable indicators. Impact magnitude is not measured in physical units but by a relative impact system. This system assigns the future state of an environmental characteristic without the project a score of zero; it then assigns the project alternative possessing the greatest impact on that characteristic a score of +5 (for positive impact) or -5 (for negative impact). The raw scores thus obtained are multiplied by weights determined subjectively by the impact analysis team.

Like the Georgia approach (University of Georgia, 1971), this methodology tests for the significance of differences between alternatives by introducing stochastic error factors and conducting repeated runs. The statistical manipulations are different from those used in the Georgia approach, however, and considered by Corps writers to be more valid.

Resource requirements of this methodology are variable. Since specific level types of data are not required, data needs are quite flexible. The consideration of error, however, requires specific skills and computer facilities.

Major limitations of the approach, aside from the required computerization, are the lack of clear guidelines about exactly how to measure impacts and the lack of guidance about how the future no project state is to be defined in the analysis. Without careful description of the assumptions made, replicability of analyses using this approach may be low, since only relative measures are used. Since all measurements are relative, it may be difficult to deal with impacts that are not clearly definable as gains or losses.

The key ideas of wider interest incorporated in this approach include reliance upon relative, rather than absolute, impact measurement; statistical tests of significance with error introduction; and specific use of the no project condition as a baseline for impact evaluation.

A Manual for Conducting Environmental Impact Studies **(Walton and Lewis, 1971; Checklist)**. This methodology is a checklist, unique in its almost total reliance upon social impact categories and strong public participation. The approach was developed for evaluating highway alternatives and identifies different impact analysis procedures for the conceptual, corridor, and design states of highway planning. All impacts are measured either by their dollar value or by a weighted function of the number of persons affected. (The weights used are to be determined subjectively by the study team.) The basis for most measurements is a personal interview with a representative of each facility or service impacted.

Resource requirements for such a technique are highly sensitive to project scale. The extensive interviewing required may make the approach impractical for many medium-sized or large projects, because agencies preparing impact statements seldom have the necessary labor or money to contract for such an extensive interviewing.

Analyses produced d by the approach may have very low replicability. This results from the lack of specific data used and the criticality of the decision regarding boundaries of the analysis, since many impacts are measured in numbers of people affected. There is also no means of systematically accounting for the extent to which these people are affected.

The key ideas of broader interest put forth by the approach are the use of only social impacts, without direct consideration of physical impacts (e g. pollution, ecology changes); the heavy dependence upon public involvement and specific suggestions about how the public may be involved; and the recognition of the need for different analyses of different project development stages. If vigorously applied, the intensive incorporation of public sentiment may achieve a desirable endpoint in spite of the lack of technical rigor.

***Environmental Guidelines* (Western Systems, 1971; Ad hoc)** The environmental guidelines are intended primarily as a planning tool for siting power generation and power transmission facilities. However, they address many of the concerns of environmental impact analysis and have been used to prepare impact statements. Viewed as an impact assessment methodology, the approach is an ad hoc procedure, suggesting general areas and types of impacts but not listing specific parameters to examine.

The approach considers a range of pollution, ecological, economic (business economics) and social impacts; however, it does not address secondary impacts, such as induced growth or energy use patterns. The format of the approach is an outline of considerations important to the selection of sites for each of several types of facilities (e.g., thermal generating plants, transmission lines, hydroelectrical and pumped storage, and substations). An additional section offers suggestions for a public information program.

Since the approach does not suggest specific means of measuring or evaluating impacts, no particular types of data or resources are required. The application of this approach is limited to electric power facilities with little carryover to other project types.

6. FUTURE DIRECTIONS

This chapter has provided guidance for choosing an environmental impact assessment methodology, a description of six general categories of methodologies, criteria for reviewing a given methodology to determine its weaknesses and strengths, a description of selected methodologies, and a reference listing of other methodologies, with a notation of the general category in which these methodologies can be classified. As mentioned previously in this chapter, depending upon the specific needs of the user and the type of project being undertaken, one particular methodology may be more useful than another. While it is possible to select one of the methodologies mentioned here for use by an agency to solve its specific needs for environmental impact analysis, no one methodology can effectively and economically be utilized for major agency programs. An agency, using the information and systems developed under existing methodologies, should investigate the feasibility of developing procedures and systems to address its specific needs for environmental impact analysis. In the long run, this can provide substantial cost savings and allow the agency to prepare meaningful and comprehensive EA/EIS.

Several new methodologies have been introduced since an earlier version of this chapter was first prepared in the mid-1970s as a research report. The information presented here is designed to acquaint the reader with general types of methodologies and provide illustrative examples of some available methodologies. Any written text captures only a small window in time and cannot be considered to cover comprehensively all existing methodologies for impact analysis. Other approaches termed "multiattribute utility theory," "systems diagrams," and "simulation modeling" may be viewed as other ways of grouping the basic methodologies described here. The Further Readings section provides information about these approaches and methodologies.

It is important to note that the CEQ regulations emphasize using an analytic rather than an encyclopaedic approach to impact analysis. This approach is expected to cut down the unnecessary bulk of environmental documents and should make the documents more useful to the decision makers. Consequently, in evaluating an impact analysis methodology, one should consider the extent to which the methodology provides analytic information as one of the important criteria for its usefulness. New methodologies are expected to include more analytic techniques than in the past.

7. FURTHER READINGS

Brouwer, Floor. *Integrated Environmental Modeling: Design and Tools.* Boston; Dordrecht, Netherlands: Kluwer Academic Publishers, 1987.

Rossini, Frederick A. and Alan L. Porter, eds. *Integrated Impact Assessment*. Boulder, Colo.: Westview Press, 1983.

The ‘assessing’ phase of EIA involves:

- identifying and defining the impacts more specifically
- analysing impacts
- determining impact significance or acceptability

The term 'environment' includes:

- human health, well-being, environmental media, ecosystems and agriculture
- climate and the atmosphere
- natural resources (regenerative and mineral)
- utilisation and disposal of residues and wastes
- resettlement, archaeological sites, landscape, monuments and social consequences as well as upstream, downstream and transboundary effects.

DAC/OECD

Impact identification methods

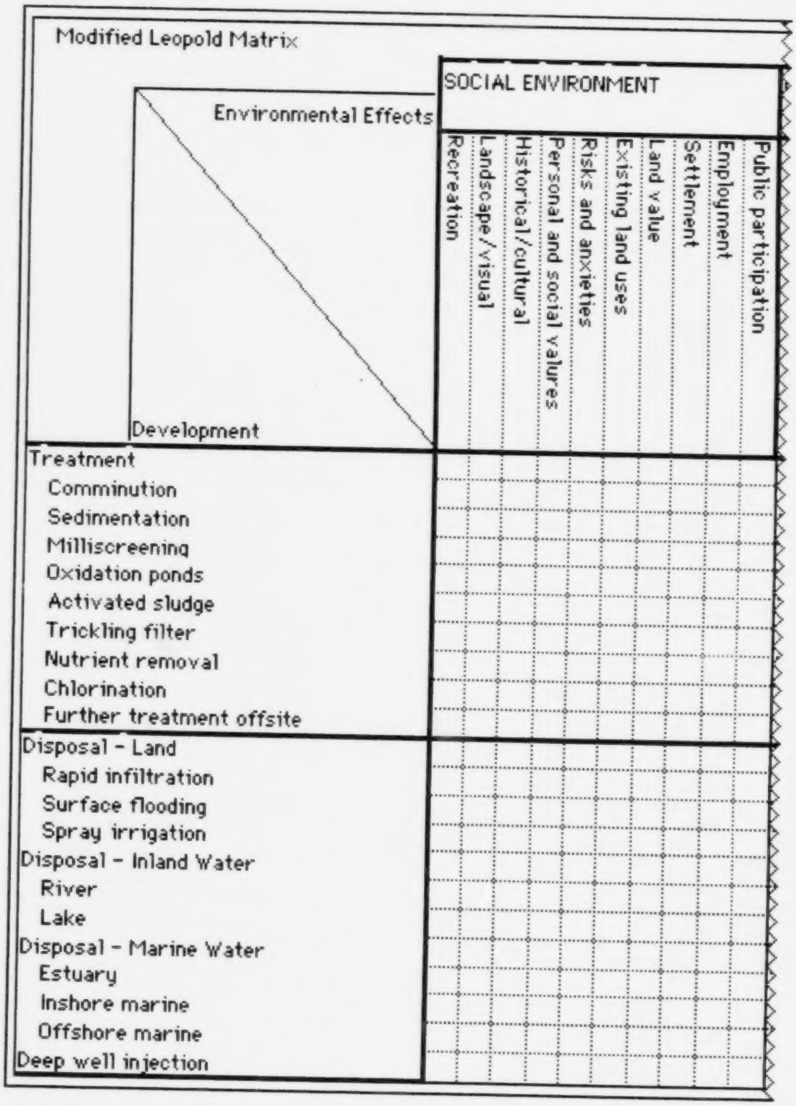
- checklists
- matrices
- networks
- overlays and geographical information systems (GIS)
- expert systems
- professional experience

Sample of a checklist

(For rural and urban water supply and sanitation projects)

Aspects of EIA	**Checklist Questions** **Will the project:**	**Yes**	**No**	**Additional Data needs**
Sources of Impacts	1. Require the acquisition or conversion of significant areas of land for reservoir/treatment works etc. (e.g. > 50 ha rural, > 5 ha urban)?	☐	☐	☐
	2. Result in significant quantities of eroded material, effluent or solid wastes?	☐	☐	☐
	3. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual workers)?	☐	☐	☐
Receptors of Impacts	4. Flood or otherwise affect areas which support conservation worthy terrestrial or aquatic ecosystems, flora or fauna (eg protected areas, wilderness areas, forest reserves, critical habitats, endangered species); or that contain sites of historical or cultural importance?	☐	☐	☐
	5. Flood or otherwise affect areas which will affect the livelihoods of local people (eg require population resettlement; affect local industry, agriculture, livestock or fish stocks; reduce the availability of natural resource goods and services)?	☐	☐	☐
	6. Involve siting sanitation treatment facilities close to human settlements (particularly where locations are susceptible to flooding)?	☐	☐	☐
	7. Affect sources of water extraction?	☐	☐	☐
Environmental Impacts	8. Cause a noticeable permanent or seasonal reduction in the volume of ground or surface water supply?	☐	☐	☐
	9. Present a significant pollution risk through liquid or solid wastes to humans, sources of water extraction, conservation worthy aquatic ecosystems and species, or commercial fish stocks?	☐	☐	☐
	10. Change the local hydrology of surface water-bodies (eg streams, rivers, lakes) such that conservation-worthy or commercially significant fish stocks are affected?	☐	☐	☐
	11. Increase the risk of diseases in areas of high population density (eg onchocerciasis, filariasis, malaria, hepatitis, gastrointestinal diseases)?	☐	☐	☐
	12. Induce secondary development, eg along access roads, or in the form of entrepreneurial services for construction and operational activities?	☐	☐	☐
Mitigation Measures	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐
Comments				
	I recommend that the programme be assigned to Category	☐		
	Signature: Delegation.......................................Desk..			

Sample of a Leopold matrix

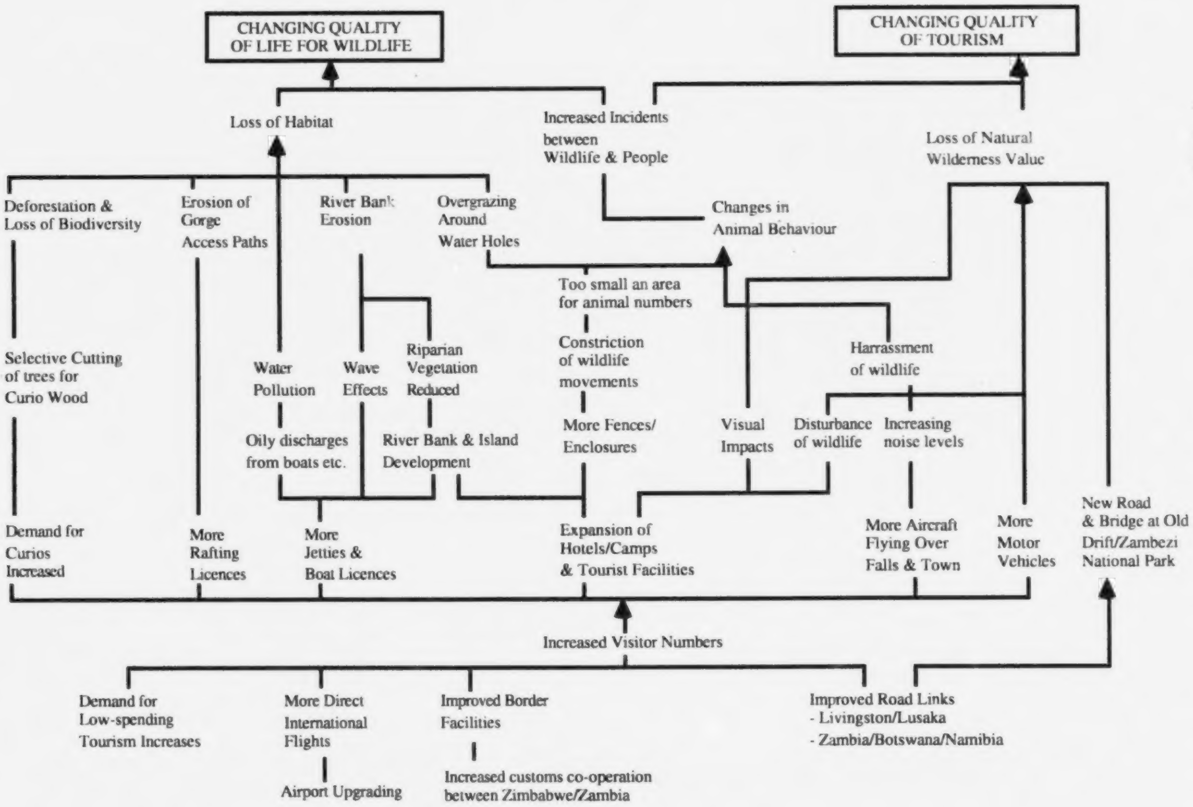


Modified Leopold Matrix

Environmental Effects	SOCIAL ENVIRONMENT									
Development	Recreation	Landscape/visual	Historical/cultural	Personal and social valures	Risks and anxieties	Existing land uses	Land value	Settlement	Employment	Public participation
Treatment										
Comminution										
Sedimentation										
Milliscreening										
Oxidation ponds										
Activated sludge										
Trickling filter										
Nutrient removal										
Chlorination										
Further treatment offsite										
Disposal - Land										
Rapid infiltration										
Surface flooding										
Spray irrigation										
Disposal - Inland Water										
River										
Lake										
Disposal - Marine Water										
Estuary										
Inshore marine										
Offshore marine										
Deep well injection										

An example of a network

(showing linkages leading to changes in quality of life, wildlife and tourism)



CHANGING QUALITY OF LIFE FOR WILDLIFE

CHANGING QUALITY OF TOURISM

Loss of Habitat

Increased Incidents between Wildlife & People

Loss of Natural Wilderness Value

Deforestation & Loss of Biodiversity

Erosion of Gorge Access Paths

River Bank Erosion

Overgrazing Around Water Holes

Changes in Animal Behaviour

Too small an area for animal numbers

Selective Cutting of trees for Curio Wood

Water Pollution

Wave Effects

Riparian Vegetation Reduced

Constriction of wildlife movements

Harrassment of wildlife

Oily discharges from boats etc.

River Bank & Island Development

More Fences/ Enclosures

Visual Impacts

Disturbance of wildlife

Increasing noise levels

Demand for Curios Increased

More Rafting Licences

More Jetties & Boat Licences

Expansion of Hotels/Camps & Tourist Facilities

More Aircraft Flying Over Falls & Town

More Motor Vehicles

New Road & Bridge at Old Drift/Zambezi National Park

Increased Visitor Numbers

Demand for Low-spending Tourism Increases

More Direct International Flights

Airport Upgrading

Improved Border Facilities

Increased customs co-operation between Zimbabwe/Zambia

Improved Road Links
- Livingston/Lusaka
- Zambia/Botswana/Namibia

(Bisset)

Choice of EIA method depends on:

- type and size of the proposal
- type of alternatives being assessed
- nature of the likely impacts
- nature of the EIA methods
- experience in using the EIA method
- resources available
- nature of the public involvement
- experience of the proponent
- procedural/administrative requirements

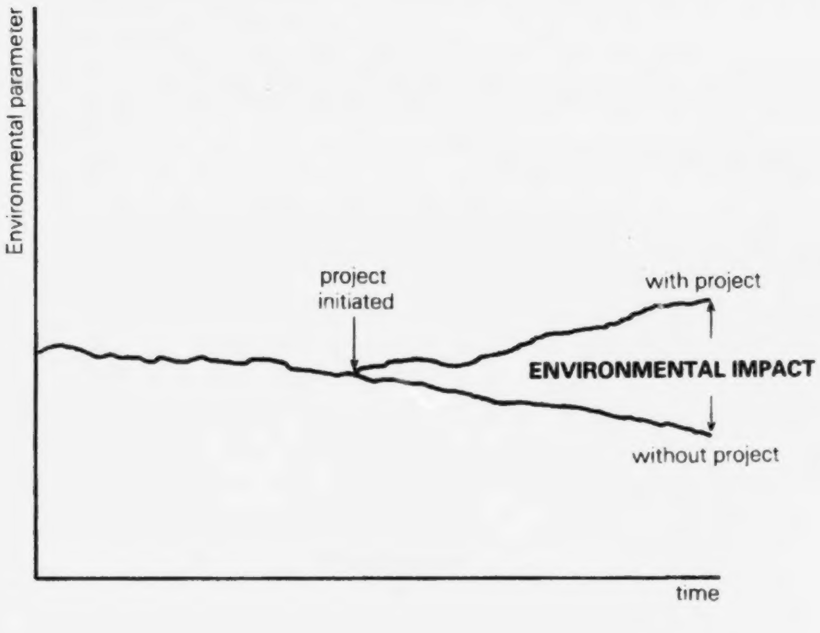
Main advantages and disadvantages of impact identification methods

	ADVANTAGES	DISADVANTAGES
Checklists **-simple** **-ranking and weighting**	• simple to understand and use • good for site selection and priority setting	• do not distinguish between direct and indirect impacts • do not link action and impact • the process of incorporating values can be controversial
Matrices	• link action to impact • good method for displaying EIA results	• difficult to distinguish direct and indirect impacts • significant potential for double-counting of impacts
Networks	• link action to impact • useful in simplified form for checking for second order impacts • handles direct and indirect impacts	• can become very complex if used beyond simplified version
Overlays	• easy to understand • good display method • good siting tool	• address only direct impacts • do not address impact duration or probability
GIS and computer expert systems	• excellent for impact identification and analysis • good for 'experimenting'	• heavy reliance on knowledge and data • often complex and expensive

Information required about the environment to establish baseline conditions:

- current status
- current and expected trends
- effects of proposals already in implementation
- effects of proposals not yet implemented

An Environmental Impact



(Wathern, 1988)

Impacts can vary in:

- nature (positive, negative, indirect, cumulative, synergistic)
- magnitude
- extent/location (area/volume covered, where impact occurs)
- timing (during construction, operation, decommissioning, immediate, delayed)
- duration (short term, long term, intermittent, continuous)
- reversibility/irreversibility
- likelihood (risk, uncertainty or confidence in prediction)
- significance (local, regional, global)

Impact characteristic summary table

IMPACT CHARACTERISTIC	IMPACT TYPE		
	air quality	health	etc
nature			
magnitude			
extent/location			
timing			
duration			
reversibility			
likelihood (risk)			
significance			

Methods of analysis of impacts:

- professional judgement
- quantitative mathematical models
- experiments, physical models
- case studies

Social impacts

- demographic
- cultural resource
- socio-cultural

Health Impacts

	Communicable disease	*Non-Communicable disease*	*Nutrition*	*Injury*
Transport	Δ			🚗
Mining		Ω		⛏
Energy		🔥		
Natural Resources	🌲		☁	
Public Services	👫			
Manufacture and Trade		🏢		✹

Δ	Brazil, 1970s - Half the malaria cases in Amazonia were linked to the narrow area of influence of the Transamazon Highway. Uganda, 1986 - Along the main link road to Kenya, 32% of the truck drivers and 68% of the women working in bars were HIV positive.
🚗	Papua New Guinea, 1980s - Traffic accidents were estimated to cost 1% of GNP.
Ω	South Africa, 1980s - Many miners suffered from permanent dust-induced lung damage. This activates latent tuberculosis. Infection rates were 800-1000 per 100,000.
⛏	Bolivia, 1970s - The population of 24,000 mineworkers in large mines had 5,430 injuries.
🔥	Household cooking on open fires may be the largest single occupational health problem of women. It leads to many respiratory and eye diseases.
🌲	Sri Lanka, 1986 - A rice development project created breeding sites for mosquitoes which transmit Japanese encephalitis. Pigs near the rice fields provided the virus. The result was an epidemic.
☁	Sri Lanka 1970s - On some tea estates child labour was common, education facilities minimal and water supplies inadequate. Chronic malnutrition and infant mortality rates were twice the rural average. Kenya, 1980s - Participants in a dairy development project sold the available milk for cash. They did not reserve enough milk to feed their children.
👫	Burma, 1950s - Satellite towns built on swampy land became waterlogged during the rains. Mosquito breeding increased. Filariasis was transmitted.
🏢	Cubato, Brazil, 1980s - There were 23 major industrial plants and many small operations. A high rate of respiratory disorders was associated with high levels of water and air pollution. Neonatal mortality and birth deformities increased.
✹	In developing countries, the annual rate of accidents causing disabling injuries to workers is 21-34%, compared to 3% in the UK.

Source: Birley, M. – Liverpool School of Tropical Medicine

Factors affecting economic impacts

- duration of construction and operation
- workforce requirements for each period
- skill requirements (local availability)
- earning
- raw material and other input purchases
- capital investment
- outputs
- the characteristics of the local economy

Factors affecting fiscal impacts

- size of investment and workforce requirements
- capacity of existing service delivery and infrastructure systems
- local/regional tax or other revenue raising processes
- demographic changes arising from project requirements

Impact significance

IMPACT CHARACTERISTICS (magnitude) X IMPACT IMPORTANCE (value) → IMPACT SIGNIFICANCE

Key elements for assessing impact significance

- level of public concern
- scientific and professional judgement
- disturbance/disruption of valued ecological systems
- negative impact on social values and quality of life

Criteria for assessing impact characteristics should:

- assign significance in a rational way
- provide consistency for the comparison of alternatives
- document the values and beliefs on which judgements are based

Impact significance criteria include:

- ecological importance
- social importance
- environmental standards
- statistical significance

Ecological importance:

- effect on plant and animal habitat
- rare and endangered species
- ecosystem resilience, sensitivity, biodiversity and carrying capacity
- viability of local species population

Social importance:

- effects on human health and safety
- potential loss of species or of farmland
- recreational or aesthetic value
- demands on public resources
- demands on transportation and other infrastructure
- demographic effects

Environmental standards:

- limits on effluent discharge concentrations
- clean air standards, water quality standards
- plans or policies that protect or limit use of natural resources

Topic 7—Mitigation and Impact Management

Objective

To identify a range of methods for mitigating and managing environmental impacts.

Relevance

The purpose of mitigation in the EIA process is to:

- look for better ways of doing things so that the negative impacts of the proposal are eliminated or minimised and the benefits are enhanced; and
- make sure that the public or individuals do not bear costs which are greater than the benefits which accrue to them.

Successful impact management requires that mitigation measures are implemented at the correct time and in the correct way. This usually requires a clearly written and agreed plan of action.

Timing

Two hours (not including training activity)

☑ Information checklist

Obtain or develop the following, as appropriate:

- ☐ EIA reports (preferably local) and associated approval conditions that have been used to generate and implement impact management plans ;
- ☐ examples of the successful design and implementation of measures as a result of EIA;
- ☐ copies or results of any research focused on mitigation or impact management;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information data resource centres who may be able to provide assistance in mitigation or impact management; and
- ☐ other resources that may be available such as courses in specific analytical or methodological techniques, videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Welcome participants to the session. Outline the overall coverage of the session, its objectives and why these are important in the EIA process.

The purpose of mitigation in the EIA process is to:

- look for better ways of doing things so that the negative impacts of the proposal are eliminated or minimised and the benefits are enhanced; and
- make sure that the public or individuals do not bear costs which are greater than the benefits which accrue to them.[1]

Successful impact management requires that mitigation measures are implemented at the correct time and in the correct way. This usually requires a clearly written and agreed plan of action.

Introduce the link between impact assessment and the mitigation of adverse impacts. Broadly discuss what mitigation seeks to achieve.

One of the main tasks of impact assessment is to predict and prevent unacceptable adverse effects through the implementation of appropriate project modifications (mitigation). In order for this process to be cost effective, it is necessary that the impact assessment be carried out at the same time as the project design and that early links are established between those doing the impact assessment and those designing the project.

1

Mitigation of impacts seeks to:

- find better ways of doing things
- minimise or eliminate negative impacts
- enhance the benefits of a proposal
- protect public and individual rights to compensation

Discuss the proponent's responsibility for implementing mitigation and the potential long term benefits to the proponent of appropriate mitigation.

The adverse consequences of projects can be felt far beyond the boundaries of the project site. In the past, many of the true costs of projects were not acknowledged or accounted for in the economic analyses of a project's worth, particularly in the operational and decommissioning phases of the project's life. Therefore, these costs were often borne by the community rather than by the proponent.

With the move towards sustainability there is now recognition that the proponent has a responsibility to 'internalise' the costs felt beyond the project boundaries and incurred over the life of the project. This has encouraged governments and agencies to require proponents to:

2

- avoid or minimise impacts through good design or design modifications (mitigation); and
- produce plans for managing impacts so that these are kept within the limits of acceptability.

While it has been argued that internalising the costs would lead to an increase in the cost of projects, this has not always been the case and many proponents have found that good design and management have actually resulted in significant savings. This outcome is similar to that found in industries applying the principles of cleaner production to improve their environmental performance. In many cases alternative production methods, although more costly in the short term, have been found to be cheaper or more effective in the long run. For instance, introducing measures to clean up effluent streams has been the catalyst for the implementation of recycling and recovery operations, with marketable by-products providing a cost return.[2]

3

Discuss the fact that effective mitigation is only possible when the full extent of the problems is understood. Outline the types of questions that can be asked in order to gain a deeper understanding of issues.

Effective mitigation requires a proper understanding of the problem. The following are pertinent questions:

Box 1: Identifying possible mitigation issues

What?

Is the problem associated with public health, ecological risks, environmental amenity or resource depletion?

Is the problem linked to specific emissions from known sources or from non-point sources of pollution?

Are the sources of pollution homogeneous or are there many different kinds of sources? Are they concentrated or geographically dispersed?

Are pollution reduction costs similar for all sources?

Does the problem require a public response or can it be decided by stakeholders if there is some forum where they can negotiate?

When?

Is the problem immediate? Does it constitute a clear and present danger, is it impending or perhaps speculative?

Is it possible to reduce or delay the problem by taking partial steps now or is full action required immediately?

What are the costs and risks of waiting for additional information?

Where?

Should the problem be addressed at the local, regional, national or international level?

Does the scope of the problem determine the level of institutional overlap or centralisation required? If not, why not?

How?

Are the pathways by which the perceived environmental problem generates people-level impacts understood?

Are victims able to avert, minimise or mitigate impacts and are there incentives for them to do so?

Who?

Which stakeholders stand to gain or lose?

Are there possibilities to mitigate special hardships, perhaps by offering subsidies to offset costs?

(Adapted from OECD,1992)

4

Outline the different ways in which mitigation can be achieved. Discuss these in detail, identifying appropriate approaches. Encourage the group to contribute to the discussion.

When significant impacts are identified in the construction, operational or decommissioning phases of a project, collaboration is required between the project designers and the EIA team to see if design changes can mitigate these problems. Depending on the nature of the impacts and the timing in the design cycle there are a number of different ways in which problems can be managed. These include:

- developing alternative ways of meeting the need
- making changes to planning and design
- improving monitoring and management practices
- compensating in monetary terms
- replacing, relocating, rehabilitating

Alternative ways of meeting the need

This option involves going back to the origins of a proposal and is most appropriate when the planning and design are at an early stage or when a 'fatal flaw' is discovered in the proposal.

Changes in planning and design

The earlier environmental factors are considered and impacts identified in the development of a project, the less financial commitment there is to a particular course of action, and the easier it is for the project to be redesigned to avoid or minimise impacts. In order for this to happen, links should be established as early as possible between the engineering, planning and EIA teams.

Those planning and designing a project should examine impacts arising from the planning, construction, operation and decommissioning phases of the project's life and be aware of sensible planning strategies that may reduce impacts. For instance, groundworks could be avoided during the rainy season to minimise surface runoff or blasting could be done outside the nesting season of migratory birds. Construction techniques could also be altered from those generating unacceptable noise, such as pile driving by impact, to those generating less noise, such as 'screwed-in' piles.

The *World Bank Environmental Assessment Sourcebook Volumes 2 and 3* contain lists of potential impacts for an extensive range of project types and suggested design measures to mitigate them . A sample of these can be seen below and in Handout 7–1. (Note that the references in the handout are to other tables within the Sourcebook.)

1

A sample from: Large Scale Housing Projects (World Bank, 1991)

Potential Negative Impacts	Mitigating Measure
DIRECT IMPACTS	
1. Displacement of existing land uses	Ensure that due consideration is given to the proper trade-offs between land values for housing and those of other uses, such as prime farmland, forests or other land uses or natural habitats of value to society as a whole. Investigate existing planning and design standards to ensure that they are suited to local conditions and not unnecessarily wasteful of land. Assist in drafting new regulations that are more appropriate.
2. Destruction of environmentally critical areas	Ensure that regionally critical environmental sites such as major forested areas, major water bodies and wetlands, habitats containing rare and endangered species, etc are identified and not threatened by project location.

Improved monitoring and management practices

The monitoring and management of impacts is a fundamental part of impact mitigation. Monitoring is required to keep track of whether impacts are of the nature that was predicted and within the levels predicted. Effective management is required to keep the impacts within the predicted levels and to deal with unforeseen impacts or problems.

Planning for impact management is dealt with in further detail later in this topic.

Compensation in monetary terms

Money can be paid for land lost or the loss of amenity resulting from a proposal. While this approach to compensation may sometimes be appropriate, there are many times when other methods of compensation, such as replacement, are more suitable, particularly when a net loss of environmental resources is predicted.

Replacement, relocation, rehabilitation

Examples of these types of mitigation are:

- 'in-kind' compensation such as the replacement of lost wetlands by constructing other wetlands, planting forests to replace those lost;
- replacing farmland;

- relocating villages or people displaced by projects; and
- rehabilitating sites after a project is complete, particularly after mining.

Because some of these types of mitigation may take place over a long period it is quite possible that the proponent will sell the development or be unable to complete the mitigation plan before it is completed. If this is a possibility, then a bond system may be required to build up, and protect, the funds over time so that the finance will be available for the required mitigation.

Other mitigation measures that might be considered for a project include:

- training for local people;
- improved transportation systems for the workers;
- promoting investment in local institutions or developing new ones to undertake long-term development and regional planning and to provide expanded social services for the public;
- planning adequate healthcare, drinking water and sanitary facilities for the benefit of the community; and
- providing the necessary social, psychological and counselling services to cope with socio-economic changes.

Often a combination of compensation and replacement, relocation or rehabilitation is needed. For example, people may be relocated and also receive financial compensation for the disruption that has been caused to their lives.

Case Studies

In the Lake Sentani Hydroelectric Development in Indonesia the environmental impact assessment resulted in the development of a number of recommendations to mitigate the impacts of the project. These include:

- compensation for lost or damaged buildings, lands and crops
- compensation so that fish resources can be maintained
- the provision of additional fishing equipment to cater for changed fishing techniques and conditions
- the provision of footbridge access at strategic points
- restoration of the site after the completion of construction

Paradine, (1989)

The environmental impact assessment for the Seco River Dam in Oaxaca Mexico recommends a number of ways to avoid or mitigate the impacts of the proposed dam:

- relocating directly affected families and replacing homes and lands
- operating and rehabilitating borrow pits in an appropriate manner
- establishing fish breeding programmes
- removing trees for wood from the site prior to flooding
- establishing environmental management programmes for the watershed, forests, grazing etc
- planting of tree barriers
- establishing agricultural practices that will reduce the need for water
- establishing technical advisory, financing and social service programmes

Sanchez-Silva and Cruz-Ulloa, (1994)

Discuss the positive contribution that EIA can make when a flexible impact management plan is produced to monitor and manage the impacts over the life of the project and to ensure that mitigation measures are implemented at the appropriate time during construction. Ask participants with experience in the implementation of EIA conditions to describe the approaches that they have found successful.

An EIA report contains a number of predictions about the environmental impacts of proposals and recommendations for their mitigation and management. Project approval is also often made conditional upon the proponent complying with a further set of requirements. In order to successfully monitor and manage the impacts and to implement the mitigation measures at the appropriate time, the proponent requires a clear plan of action. Depending upon the requirements of the EIA system, this plan of action may be included in, or appended to, the EIA report. It is often referred to as an impact management plan.

An impact management plan (see Handout 7-2) should:

- contain a statement of the proponent's environmental policy including compliance of the project with any legislation or standards;
- designate a person to be responsible for the overall implementation of the plan;
- include a schedule of tasks to be undertaken to comply with the recommendations of the EIA report and the requirements of the approval. This schedule should include any required training of staff;
- allocate responsibility for carrying out the tasks;
- include a system of reporting on the progress of the tasks (and budget);
- include a system for the monitoring and auditing of the plan's achievements in environmental protection/enhancement; and
- contain a contingency plan of actions to be taken when monitoring results indicate that impacts are not in accordance with predictions or required standards.

The impact management plan can be used as the basis for generating the environmental performance standards and requirements that can be included in the contracts of those carrying out the works or providing supplies. It can also be used as the basis of an environmental management system during the operational phase of the proposal.

Case Study

Translating EIA Recommendations into Project Documentation

China: Second Ertan Hydroelectric Project

This project represents an excellent example of incorporating EIA mitigation and monitoring plans into project documentation, presenting the persons and agencies responsible for the programmes, general elements such as start-up date, study locations, data collection methods and data analysis type, and the budgetary layout through year 2000. The detailed environmental measures represent an important step forward in institutionalizing environmental aspects in project design and implementation thereby increasing the effectiveness of the EIA process.

The World Bank, (1995)

Include a training activity to reinforce the topic (if desired).

Summarize the presentation and preview the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Sadar, M.H. and Associates (1995) *Environmental Impact Assessment*. Carleton University Press. Ottawa, Canada.

2. OECD (1992) *Economic Instruments for Environmental Management in Developing Countries*. Paris

McLaren, D.E. (1993) Environmental Considerations and Public Involvement in the Assessment of Impacts of Tourism Development in Third World Countries. *Impact Assessment*. vol 11 (2)

Paradine, P. (1989) EIA at Work. A Hydroelectric Project in Indonesia, in *Strengthening Environmental Co-operation with Developing Countries*. OECD. Paris

Sanchez-Silva, R. and Cruz-Ulloa, S. (1994) Environmental Impact of an Agricultural Project in La Roca, Oxaca, Mexico. *Impact Assessment*. vol 12 (1)

The World Bank (1991) Environmental Assessment Sourcebook (three volumes). World Bank Technical Papers Nos. 139, 140 and 154. The World Bank. Washington. Tables 9.5

The World Bank (1995) *Environmental Assessment Challenges and Good Practice*. Environmental Department Papers. No. 18. Washington

Further reading

Bisset, R. (1996) *EIA: Issues, Trends and Practice*. Environment and Economics Unit UNEP. Nairobi

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

7–1 For a particular project type, get the group to suggest the range of typical impacts that could be experienced and the different ways in which these impacts could be mitigated.

7–2 Identify the types of situations when 'in-kind' compensation should be required of proponents. What can be done if an 'in-kind' solution appears to be impracticable?

7–3 As a group, develop a checklist method for producing an impact management plan from an EIA report and any associated approval conditions.

7–4 Discuss approaches that can be taken to encourage construction contractors to comply with the environmental policy of the proponent.

7–5 Discuss the difference in approach to the mitigation and management of impacts that will definitely occur (such as air discharge) as against those that are unlikely to occur but may have large scale consequences if they do (such as an oil spill or bleve).

Speaker themes

7–1 Invite a speaker who has experience in implementing the recommendations of EIA reports to outline the approaches that have, and have not, been successful.

7–2 Invite a speaker who has produced an impact management plan to outline the process that was used to generate the document and to comment on how successful it has been in practice.

7–3 Invite, as a speaker, a proponent/project manager who has successfully coordinated the EIA and design teams for a proposal so that there has been the early identification and mitigation of adverse environmental impacts.

Group Activity 7-1: Mitigation and Impact Management

Title	**Producing impact management plans**
Aim	Practise in identifying project recommendations, approval conditions and items that require monitoring and in turning them into specific, actionable tasks.
Group size	Four or five people
Duration	Half-day

Resources required

- ☐ EIA reports and case study materials for each group.

Description of activity:

- ☐ as a group develop the main elements of an impact management plan for the case study project (see Handout 7-2 *Preparing an impact management plan*);
- ☐ each group then reports back to the whole group; and
- ☐ the group as a whole identifies commonalities and differences in the different plans.

Group Activity 7-2: Mitigation and Impact Management

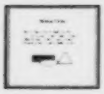
Title	**Impact mitigation**
Aim	Practise in the quick identification of potential major impacts and possible mitigation measures.
Group size	Three or four people
Duration	One hour

Resources required

- A set of approximately five project outlines and descriptions of environmental settings.

Description of activity:

- Spending approximately ten minutes on each project, identify the potential major impacts associated with each proposal and outline mitigation measures that might be appropriate in each case.


1

Mitigation seeks to:

- find better ways of doing things
- minimise or eliminate negative impacts
- enhance project benefits
- protect public and individual rights to compensation

2

Proponents have a responsibility to:

- avoid or minimise impacts
- plan for managing impacts

3

Understanding the problem is the key to effective mitigation. Ask:

- what the problem is
- when the problem will occur and when should it be addressed
- where the problem should be addressed
- how the problem should be addressed
- who stands to gain or lose

4

Mitigation options:

- alternative ways of meeting the need
- changes in planning and design
- improving monitoring and management
- monetary compensation
- replacing, relocating, rehabilitating

5

Impact management plans:

- state policy and standards
- designate responsibility
- provide a schedule of tasks, including training
- allocate responsibility for tasks
- include a system of reporting
- include a system for monitoring and auditing
- contain a contingency plan

Mitigation for Large Scale Housing Projects

Potential Negative Impacts	Mitigating Measure
DIRECT IMPACTS	
1. Displacement of existing land uses	Ensure that due consideration is given to the proper trade-offs between land values for housing and those of other uses, such as prime farmland, forests or other land uses or natural habitats of value to society as a whole. Investigate existing planning and design standards to ensure that they are suited to local conditions and not unnecessarily wasteful of land. Assist in drafting new regulations that are more appropriate.
2. Destruction of environmentally critical areas	Ensure that regionally critical environmental sites such as major forested areas, major water bodies and wetlands, habitats containing rare and endangered species, etc are identified and not threatened by project location.
3. Danger to residents from hazardous natural conditions	Ensure that project site is not located in the following areas: • major floodplain • coastal zone inundation areas • areas of unstable soil or subsurface conditions • areas of highly saline soils • areas subject to landslides • seismically or volcanically active areas • excessively steep or wet areas • areas where significant risk from disease vectors exist or any other areas of significant natural hazard. Design accordingly if site cannot be moved.
4. Danger to residents from hazardous man-made conditions	Identify areas that have significant man-made hazards such as filled land, areas subject to subsidence from mining activity, groundwater, oil or other extractive process Identify areas where solid or liquid or toxic wastes may be, or have been, dumped. Investigate site conditions with proper geo-technical or chemical testing procedures. Ensure that adequate funding and technical expertise are available to deal with the special conditions. Investigate alternate sites.
5. Hazard to residents from air, water or noise pollution from other adjacent or nearby land uses	Ensure that the site is located away from such pollution sources. Do not locate down-wind of significant point sources of air pollution such as smoke stacks, for example. Identify noise sheds around airports, major roads etc. Provide buffers of other compatible uses of adequate width between residential areas and sources of pollution. Take measures to abate pollution at the sources, if feasible, such as noise barriers along expressways. Investigate alternate sites.
6. Hazard to residents from air pollution due to site location being in an area subject to frequent temperature inversions	Seek alternate site locations if pollution is from existing sources that are difficult to abate. Otherwise design project with low densities and non-polluting technologies for heating, cooking etc.
7. Dislocation of existing resident populations	Ensure that any involuntary resettlement is done in accordance with proper standards or consider alternate sites.
8. Destruction of historic or cultural resources	Consider alternate sites or make provision for historic culturally significant areas to be set aside in specially zoned areas.
9. Overloading of existing infrastructure and services	Coordinate with other planning goals and objectives for region. Upgrade existing infrastructure and services, if feasible. Consider alternate sites.
10. Excessive depletion of resources such as lumber or fuel or overtaxing of traditional industries, such as brickmaking	Review capacity of local resources and industries to provide for large-scale construction and upgrade if feasible. Select materials and design criteria according to local conditions and availability of resources. Design for maximum efficiency in material and energy use. Encourage the study of indigenous customs and techniques for building and incorporate in project design.

Mitigation for Large Scale Housing Projects

Potential Negative Impacts	Mitigating Measure
LOCAL AND SITE SCALE IMPACTS	
11. Damage to sites and their immediate surroundings resulting from the disruption of the basic natural framework of the environment, in particular the soils, vegetation and drainage network (see below for more detailed comments).	Identify the basic natural systems of a site and its immediate surroundings and protect with set-asides for open space, easements and buffer areas etc. Adapt layouts to fit natural patterns rather than imposing rigid geometries.
12. Degradation of habitats caused by fragmentation	Maintain and/or design open space networks to follow natural site features, such as stream corridors and connect them throughout the site and local and regional open space systems.
13. More extreme flood/drought cycles, increased erosion and siltation and degradation of stream biota and riparian vegetation etc caused by increased runoff from developed sites	Preserve existing vegetation, particularly intact natural habitats. Institute a stormwater management plan which should consider strategies such as: • minimising impervious area • increasing infiltration to soil by use of recharge areas • the use of natural vegetated swales instead of pipes or • by using detention or retention facilities with graduated outlet control structures. Use 'soft engineering' techniques for soil and bank stabilization such as vegetative stabilization (soil bio-engineering) in preference to built structures.
14. Depletion and/or pollution of local groundwater resources	Ensure that projected use of groundwater is within the capacity of natural system to replenish itself. Avoid 'mining' groundwater particularly in drier climates. Use indigenous vegetation that requires less water, drip irrigation or shaded plantings. Ensure that soils are suitable for septic tank or other on-site treatment. Design stormwater management systems as suggested above, in particular use vegetation to retain recharge and purify stormwater.
15. Degradation of soil cover from erosion, removal, or loss of soil structure due to compaction	Have both temporary (during construction) and permanent erosion control plans. Temporary control plans should include: • silt fencing • temporary silt trap basins • short term seeding or mulching of exposed soil areas (particularly on slopes) • limitations on access for heavy machinery and the storage of materials to avoid soil compaction. Permanent erosion control plans should focus on the establishment of stable native vegetation communities. Ensure that topsoil in construction areas is stripped and stored for future use and not illegally removed from site.
16. Loss or degradation of vegetation from unnecessary removal or mechanical damage	Identify important stands of vegetation, large contiguous stands of forest or other habitat, vegetation on steep slopes, vegetated stream corridors or swales. Incorporate these areas into design layout or open space system. Protect such areas during construction by temporary fencing and limitations on access for heavy machinery and materials storage.
17. Degradation of habitat from inappropriate management or introduction of invasive exotic species	Protect natural habitat from destructive management or maintenance practices, such as the removal of understorey vegetation from woodlands, or excessive clearance of vegetation from stream banks. Do not use invasive exotic species for landscaping or reforestation.

From: Environmental Assessment Sourcebook (World Bank, 1991)

Mitigation for Roads and Highways

Potential Negative Impacts	Mitigating Measure
DIRECT IMPACTS	
1. Increased sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps.	Protect susceptible surfaces with mulch or fabric, and plant erodible surfaces as soon as possible.
2. Soil and water contamination by oil, grease, fuel and paint in equipment yards and asphalt plants.	Collect and recycle lubricants. Avoid accidental spills through good practice.
3. Air pollution from asphalt plants.	Install and operate air pollution control equipment.
4. Local dust and noise.	Periodically water down or lightly oil temporary roads. Install and maintain mufflers on equipment.
5. Air and noise pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas.	Include physical barriers to noise in plans. Require adherence to engine maintenance schedules and standards (or use alternative fuels) to reduce air pollution. Enhance public transportation and traffic management capability.
6. Landscape disfiguration by embankments and deep cuts, fills and quarries.	Use an architectural design to 'blend' with the landscape. Replant disfigured surfaces.
7. Landslides, slumps, slips and other mass movements in road cuts.	Provide drainage works as needed to reduce risk, according to prior surveys. Align route to avoid inherently unstable areas. Stabilize road cuts with structures (concrete walls, dry wall masonry, gabions, etc).
8. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains.	Increase number of drain outlets. Place drain outlets so as to avoid cascade effect, Line receiving surface with stones, concrete.
9. Roadside litter.	Provide for disposal facilities. Encourage anti-littering laws and regulations.
10. Hazardous driving conditions where construction interferes with pre-existing roads.	Provide in design for proper markers on roads, including lights.
11. Alteration of overland drainage and subsoil drainage (where road cuts intercept perched water tables, springs etc).	Installation of adequate drainage works.
12. Destruction of vegetation and wildlife in the right-of-way occupied by the highway.	Realignment where possible to detour exceptional areas, identified by prior surveys.
13. Destruction or damage of terrestrial wildlife habitats, biological resources or ecosystems that should be preserved.	Plan national transportation route alignment according to location of fragile, unique, etc areas.
14. Alteration of hydrological regimes of wetlands by causeways, with harmful effects on these ecosystems.	Realignment to avoid wetlands. Installation of culverts, bridges, etc as needed and according to criteria from prior hydrological surveys. See 'Wetlands' section.
15. Interruption of migratory routes for wildlife and livestock. Increased collisions with animals.	Realign to avoid important migratory routes. Provide undergrade crossings.
16. Poor sanitation and solid waste disposal in construction camps and work sites.	Provide adequately located and maintained latrines.
17. Possible transmission of communicable diseases from workers to local populations and vice-versa.	Periodic health examinations of workers with treatment when needed.
18. Creation of temporary breeding habitats for mosquito vectors of disease, eg sunny, stagnant pools of water.	Assess vector ecology in work areas and take steps where possible to avoid creating habitats.
19. Creation of transmission corridor for diseases, pests, weeds and other undesirable organisms.	Set up plant and animal sanitation service and related checkpoints.

Mitigation for Roads and Highways

Potential Negative Impacts	Mitigating Measure
20. Poaching by construction workers.	Prohibit poaching under terms of employment.
21. Dislocation and compulsory resettlement of people living on the right-of-way. Near cities and in rich farming regions, many people can be affected.	See 'Involuntary Resettlement' section. Locally unprecedented mechanisms and procedures may be required to arrive at equitable and adequate compensation, and a companion effort to develop the capacity may be required.
22. Obstruction of routes from homes to farms, etc increasing travel time.	Provide appropriately designed and located crossings.
23. Impairment of non-motored transportation in the highway corridor due to reduced or impeded rights-of-way.	Design and implement safety measures and an emergency plan to contain damages from accidental spills. Designate special routes for hazardous materials transport. See 'Industrial Hazard Management' and 'Public Health and Safety' sections.
INDIRECT	
25. Induced development: roadside commercial, industrial, residential and 'urban sprawl'.	Involve landuse planning agencies at all levels in project design and EA and plan for controlled development.
26. Increased motorized transportation (with possible increased dependency on imported fuels).	Include project components to encourage use of no-motorized transportation.
27. Impairment of non-motorized transportation economy due to changes in land use and/or increased availability of motorized alternatives.	Include project components to stimulate local production and use of non-motorized modes of transportation.
28. Unplanned or illegal timber cutting.	See 'Rural Roads' section.
29. Unplanned or illegal land clearing.	See 'Rural Roads' section.
30. Illegal invasion by squatters and poachers of homelands of indigenous peoples.	See 'Indigenous Peoples' and 'Induced Development' sections in Chapter 3.

From: Environmental Assessment Sourcebook (World Bank, 1991)

Note: Examples of mitigating measures for other types of projects can be located in the Sourcebook.

Preparing an impact management plan

1. Note or establish an environmental policy for the proposal

- an environmental policy for a proposal should contain a concise statement of the commitment to certain standards of environmental performance and behaviour. It could for instance state that 'Maximum use will be made of locally grown plantation timbers' or that 'All contractors will be required to produce their own environmental management plans and quality reports as the initial part of their contracts.'
- think of ways to raise stakeholder awareness and commitment to the policy (employees, contractors, suppliers, client, community) and to ensure that they understand what is trying to be achieved and why

2. Designate a person to take overall responsibility for the impact management plan

A person or a group need to be specifically allocated responsibility for the development, implementation and performance review of the impact management plan.

3. Identify tasks

- examine the EIA and the conditions for approval to identify all commitments and obligations made to the environment
- identify any other environmental /impact management requirements arising from regulations, policies, guidelines etc
- include requirements for training of staff
- identify a range of implementation tools that can be used to ensure that impact management is undertaken eg setting objective conditions for contracts, tenders, permits and licenses, establishing performance bonds to ensure environmental outcomes are achieved etc

4. Establish a plan and allocate responsibility

- create a time based schedule of the identified tasks and allocate responsibility for each of them (see sample outline)
- develop contingency plans that highlight actions to be taken and assign obligations in the event of the detection of unacceptable adverse impacts
- ensure that the those undertaking the detailed design of the project incorporate all commitments and obligations
- budget for the plan

Impact Management Plan-Sample Task Schedule

No.	Task Description	Responsible person/unit	Start Date	Finish Date	1996				1997				1998			

5. Develop a management system for monitoring, reporting and response

- develop monitoring requirements and responsibilities
- establish a system of reporting at intervals that are appropriate to the various tasks (daily, weekly, monthly)
- establish a system for data storage, retrieval and access
- establish a system for investigating and responding to complaints and enquires from outside parties

6. Implement management system

7. Review Performance

- establish a system of meetings to review issues arising out of the reporting and to focus on preventative and remedial measures
- conduct regular independent audits (compliance and surveillance)
- update/review the impact management plan regularly

ENVIRONMENTAL IMPACT ASSESSMENT OF AN OPENCAST COAL MINING PROJECT

A. V. Chiplunkar

In Biswas, A.K. and Agarwala, S.B.C. (eds) (1992) *Environmental Impact Assessment for Developing Countries*. Butterworth-Heinemann Ltd. Oxford, UK.

The Government of India has accorded high priority to the protection and restoration of the environment in mining areas. It has been made obligatory to submit environment management plans (EMP) for proposed mining projects. The Department of Environment, Forests and Wildlife, Government of India, has issued guidelines for preparation of EMP and involves the following aspects:

1. description of project activities including their environmental implications;
2. collection of baseline data of environmental setting around the project;
3. anticipated environmental impacts due to proposed project;
4. Environment Management Plan including proposed safeguards to control adverse impacts, implementation and monitoring schedule.

This chapter briefly reviews various aspects of the EMP for an opencast coal mining project in order to bring out the adverse impacts of the project and discusses the environment protection measures proposed along with the costs. A case study has been selected on the basis of a study undertaken for Karo Phase I Opencast Project in East Bokaro Coalfields.

CASE STUDY DETAILS

Project

Karo Phase I Opencast Project (OCP) is part of East Bokaro Coalfields in Bihar to be developed by Central Coalfields Ltd. (Figure 4.1). It is planned to produce coal at 1.5 million tonnes per year (MTY) to meet the coal requirements of Tenughat Thermal Power Station Phase II (2 x 210 MW). The site is located about 40 km south-west of Dhanbad.

Reserves and overburden

The mineable reserves of coal have been estimated as 70.91 million tonnes (MT). At a rated capacity of 1.5 MTY, the life of the project is about 50 years. The average stripping ratio is 0.63m^3 overburden per tonne of coal, due to which 44.33 million m^3 overburden will be generated during the project life.

Mining activities

The selected method for mining is the 'shovel and dumper system'. The heavy earth moving machinery (HEMM) mainly comprises 3.8m^3 electric hydraulic shovels, 5.0m^3 electric rope shovels, 35 T dumpers and 320-410 HP dozers. The activities involved are as follows:

1. drilling and blasting
2. removal of coal and overburden
3. sizing of coal in coal handling plant (CHP)
4. disposal of overburden
5. transportation of clean coal.

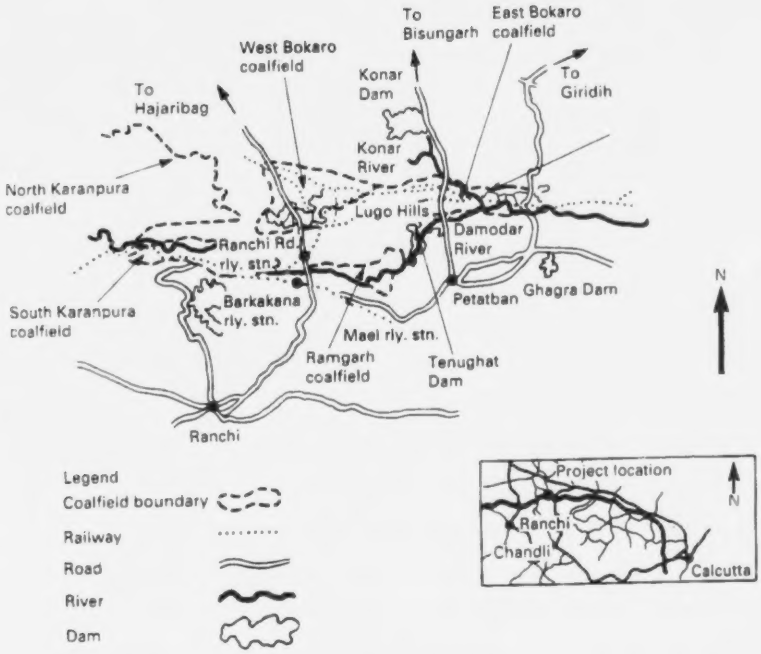

To Bisungarh
East Bokaro coalfield
West Bokaro coalfield
Konar Dam
To Giridih
To Hajaribag
Konar River
North Karanpura coalfield
Lugo Hills
Damodar River
Ranchi Rd. rly. stn.
Barkakana rly. stn.
Petatban
Ghagra Dam
N
South Karanpura coalfield
Mael rly. stn.
Ramgarh coalfield
Tenughat Dam
Ranchi
Legend
Coalfield boundary
Railway
Road
River
Dam
Project location
N
Ranchi
Chandli
Calcutta

Figure 4.1 Project location

Land requirement

The land requirement for the project is given in Table 4.1. As indicated therein the project requires 302 ha forest land.

Water requirement

The water requirements of the project in million litres per day (MLD) are as under:

1	Potable water demand (schools, residents, canteens etc.)	0.37MLD
2	Industrial water demand (washing HEMM, dust suppression, fire fighting etc.)	0.27MLD
	Total	0.64MLD

Services

The total manpower to be deployed for the project is 660 of which 363 persons will be provided housing. The infrastructure and support services include service buildings, rest house, school, hospital, bank, water supply, sewerage, transport and communication facilities, electricity etc.

Environmental setting

The proposed project site lies in the eastern part of Chota Nagpur plateau of Bihar State. The general topography of the project area as well as surrounding area is very rough and hilly. The average elevation ranges between 243m and 335m. The forest land which covers the large project area and also the surrounding area is of a dry deciduous type. However recent Landsat imagery indicates absence of vegetative growth though the land is designated as forest land.

Table 4.1 Land requirements of project

Sr. No.	Purpose	Forest land (ha)	Other land (ha)	Total land (ha)
1.	Quarry area	118	22	140
2.	External overburden dump area	123	11	134
3.	Infrastructure, roads, CHP, substation etc.	61	15	76
4.	Colony area	-	12	12
	TOTAL	302	60	362

The project site is surrounded by existing coalfields, the impact of which already exists in the baseline environmental quality data generated for this project.

The river Damodar flowing to the south is the main receiving water body for all liquid wastes joining it through drains. Its quality, as measured at more than nine locations over a distance of more than 6km, largely conforms to Class 'A' waters as per ISO:2296, viz. drinking water source after disinfection only.

The climatological conditions are similar to Dhanbad. Hence Indian Meteorological Department (IMD) data for Dhanbad was used in addition to that generated in East Bokaro Coalfield area.

The ambient air quality is characterized by high suspended particulate matter (SPM) above 200 $\mu g/m^3$ (200-570 $\mu g/m^3$), significant presence of oxides of nitrogen in a range 40-70 $\mu g/m^3$ and very low concentrations of SO_2 (less than 5 $\mu g/m^3$).

The socio-economic profile indicates very rapid growth of population (79 per cent per decade during 1970-80) due to availability of better employment opportunities, higher literacy rate (45-75 per cent), improved transport and communication means but lack of adequate facilities for water supply (especially in summer) and sewerage.

ENVIRONMENT IMPACT ASSESSMENT

An EIA study was done for the premining phase and operational phase. The impacting actions and environmental parameters affected are depicted in Figure 4.2. The evaluation of environmental impact has been done by the 'Matrix Method' and is presented in Table 4.5 at the end of this section.

IMPACT ON AIR QUALITY

The activities contributing to air pollution are blasting and drilling, operation of petrol and diesel driven HEMM, transportation of coal and overburden, screening and crushing activity in CHP and overburden dumps.

The predicted pollutant concentrations at the proposed project site without mitigation measures are given in Table 4.2.

Thus the major impact on air quality will be due to generation of dust affecting SPM and dustfall rate significantly within the project area. Its impact on surrounding ambient air quality will be limited due to criss-crossing of hills which will arrest free flow.

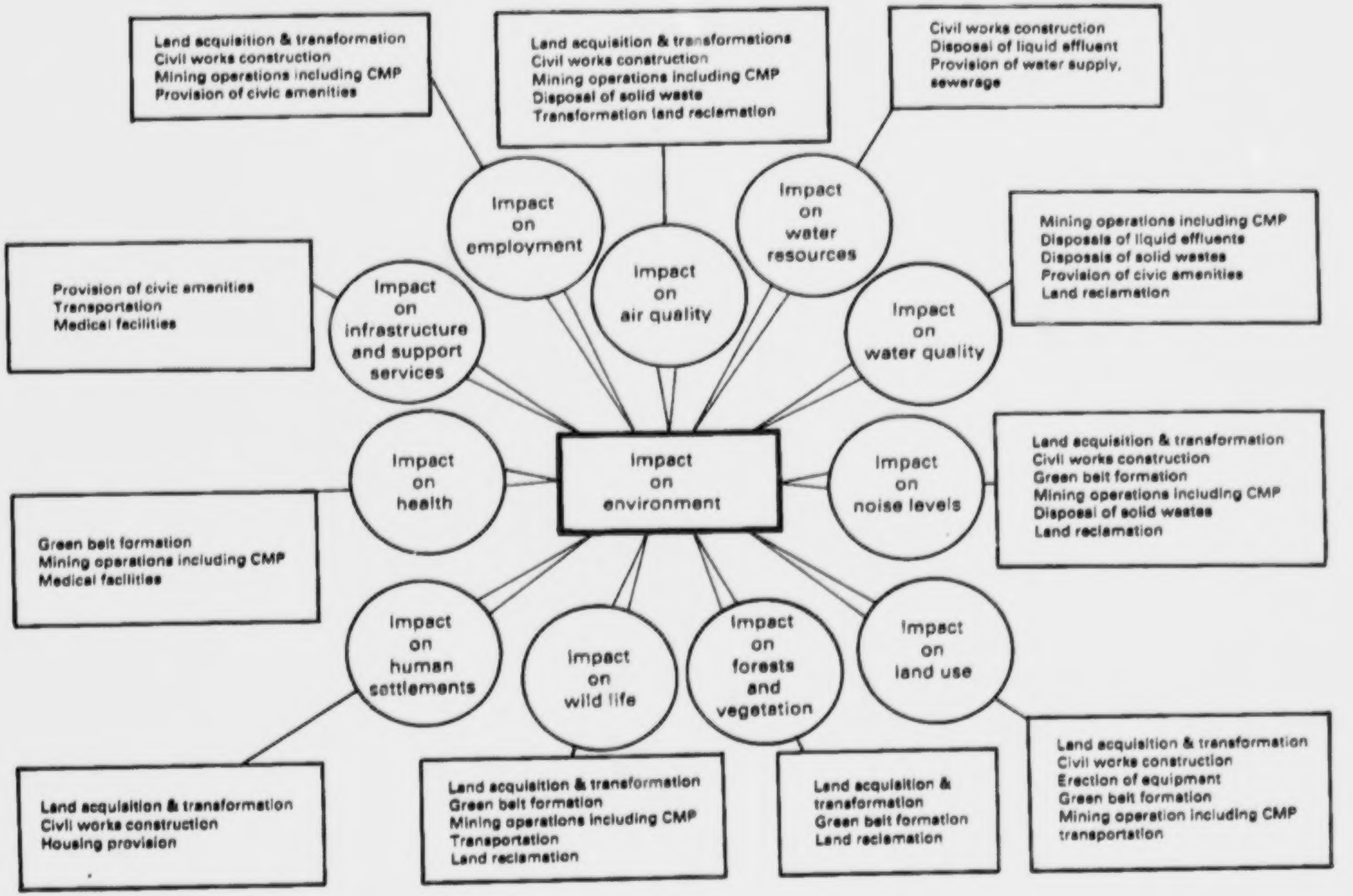

Land acquisition & transformation
Civil works construction
Mining operations including CMP
Provision of civic amenities
Land acquisition & transformations
Civil works construction
Mining operations including CMP
Disposal of solid waste
Transformation land reclamation
Civil works construction
Disposal of liquid effluent
Provision of water supply, sewerage
Impact on employment
Impact on air quality
Impact on water resources
Mining operations including CMP
Disposals of liquid effluents
Disposals of solid wastes
Provision of civic amenities
Land reclamation
Provision of civic amenities
Transportation
Medical facilities
Impact on infrastructure and support services
Impact on water quality
Impact on health
Impact on environment
Impact on noise levels
Land acquisition & transformation
Civil works construction
Green belt formation
Mining operations including CMP
Disposal of solid wastes
Land reclamation
Green belt formation
Mining operations including CMP
Medical facilities
Impact on human settlements
Impact on wild life
Impact on forests and vegetation
Impact on land use
Land acquisition & transformation
Civil works construction
Housing provision
Land acquisition & transformation
Green belt formation
Mining operations including CMP
Transportation
Land reclamation
Land acquisition & transformation
Green belt formation
Land reclamation
Land acquisition & transformation
Civil works construction
Erection of equipment
Green belt formation
Mining operation including CMP
transportation

Figure 4.2 Summary of environmental impacts of Karo-I OCP

IMPACT ON WATER RESOURCES

The withdrawal of 0.64 MLD from Damodar river will not have any impact. The mine water pumping however is significant in quantity. In summer it is expected to be 10-15 MLD, while in monsoon, due to accumulated surface run-off in excavated pits, it is expected to be about 215 MLD. This is let off into drains.

The scarcity of water in summer is experienced in surrounding villages. But as the project is on hilly terrain with villages at foothills, the impact is reduced compared with a situation when the terrain is flat.

IMPACT ON WATER QUALITY

The two major sources for effluent are mine water and domestic and service effluents.

The mine water is proposed to be discharged into Karo drain (joining Damodar river) after settling in the drain itself by construction of bunds, to reduce suspended solids.

The domestic effluent will be treated by trickling filters to limits specified by ISO:4764 and let off. The quantity (0.3 MLD) compared with the mine water is negligible.

The existing quality of Damodar river will therefore not be affected as the discharges will be within specified limits for discharge of effluents into inland surface water. Table 4.3 presents the existing quality of river, effluent quality and the standards.

No appreciable impact is envisaged on the water quality of the receiving body.

Table 4.2 Predicted air quality at proposed project site

Sr. No.	*Location*	*SPM (mg/m^3)*	*NO_x (mg/m^3)*	*SO_2 (mg/m^3)*	*Dust Fall (mg/m^3) day*
1.	Opencast mining operations area	200-500	25-65	Up to 2.0	400-2000
2.	Movement of HEMM, dumping area	200-500*	40-65	Up to 2.0	Up to 2000
3.	Residential colony	50-400	40-65	Up to 1.5	200-2000
4.	Baseline area at Chalkari village	318	44	2.3	1245

**May exceed 500 at times up to 600.*

IMPACT ON NOISE LEVELS

Various measurements at noise generating activity locations for estimating the background noise level, equivalent noise level exposure for 30 min exposure and peak noise levels were taken for similar existing projects.

Table 4.4 summarizes the anticipated levels and permissible exposure limits.

Considering that permissible continuous exposure in the industrial area varies between 90 dBA for 8h to 108 dBA for 7.5min, and not more than 65 dBA for 8h per day in the residential zone, the impact on noise levels is significant .

Table 4.3 Water quality of effluent and Damodar river

Sr. No.	Parameter (mg/l	Class 'A' water (ISO-2296)	Damodar river	Mine water before treatment*	Discharge limits ISO-2490
1.	pH	6.5-8.5	6.8-7.4	5.2	5.5-9.0
2.	Temp (deg. C)	NS	30-37	31	40
3.	TDS	500	80-260	240	2100
4.	TSS	NS	35-770	410	100
5.	BOD	2	0.5-7.2	6	30
6.	COD[5]	NS	33-1161	63	250
7.	Oil and grease	0.01	BDL	BDL	NS
8.	Chlorides (Cl)	250	28-48	20	1000
9.	Nitrates (N)	20	BDL-8.4	2.1	NS
10.	Sulphates (SO_4)	400	28-132	122	1000
11.	Phosphates (PO_4)	NS	0.18-0.72	0.24	5
12.	Kjeldhal N	NS	0.2-1.0	0.2	100
13.	Fluorides (F)	1.5	0.3-0.7	-	-
14.	Iron (Fe)	0.30	0.1-0.9	0.37	NS
15.	Particle size of TSS (micron)	NS	200-425	Up to 300	850

*NS, Not specified; BDL, Below detectable limits; *, Based on adjoining Karo Special Project.*

Table 4.4 Anticipated noise levels (dBA)

Sr. No.	Zone	Background	Equivalent	Peak
1.	Industrial activity zone	53-57	74-99	99-149
2.	Project administration office	41-58	41-75	94-109
3.	Residential colony at site	46-51	68	101-105
4.	Village near mining project	44	65	102

(65 dBA for 8 h per day in the residential zone, the impact on noise levels is significant.)

IMPACT ON LAND USE

The major impact on existing land use during the pre-project stage is the deforestation of 283 ha of forest land (19 ha in the safety zone will not be removed).

The major post-mining impact on land use is the creation of an external overburden dump on 134 ha, creation of a void of 24.8 million m^3 covering an area of 47 ha in the quarry area, and creation of civil structures etc. This will be the single and most adverse impact. Not only is the land deforested but it is further made unfit for any positive use in the absence of stabilization and reclamation measures.

IMPACT ON FORESTS, VEGETATION AND WILDLIFE

Loss of vegetative cover results in increased soil erosion, degradation of soil quality, reduction of moisture retention capacity andremoval of moderating effect on climate and brings about a change in local ecology.

The loss of habitat has a significant adverse impact on population and density of fauna.

IMPACT ON HUMAN SETTLEMENTS

The provision of housing to 55 per cent of staff is beneficial as it eases the strain on surrounding areas. But there will be a significant impact due to the migration of experienced people which is increasing at 79 per cent per decade due to increased employment opportunities.

There will be negligible displacement of families as over 83 per cent of the land is forest-land. Acquisition of private tenancy land is almost negligible as the balance is mostly government land.

IMPACT ON HEALTH

The major impact will be on the health of mine workers who will be exposed to noise and dust pollution resulting in gradual but permanent health deterioration. Present experience indicates the prevalence of nystagmus, pneumoconiosis and hearing losses to be common.

IMPACT ON INFRASTRUCTURE AND SUPPORT SERVICES

There will be an appreciable beneficial impact on roads, transport and communication facilities, power, civic amenities like water supply and sewerage, medical services, educational facilities, markets and recreation.

IMPACT ON EMPLOYMENT

The proposed project will have a significant impact in providing employment opportunities. Present trends indicate that more than 50 per cent of the work-force is engaged in mining and allied activities.

ENVIRONMENTAL IMPACT WITHOUT CONTROL MEASURES

The environmental impact of the project during the pre-mining and operational phase of the project has been assessed by the Matrix Method as depicted in Table 4.5. The criteria adopted for quantitative evaluation of impact are as follows:

Severity criteria	*Impact score*
No impact	0
No appreciable impact	1
Significant impact - slight or short term effect	2
Major impact - occasional irreversible effect	3
High impact - irreversible or long term effect	4
Permanent impact	5

The importance value attached to each environmental parameter is based on the priority assigned by the Department of Environment, Forests and Wildlife, Government of India, to various environmental problems. The total impact score has been assessed as follows:

Up to - 1000:	No appreciable impact on environment.
- 1000 to - 2000:	Appreciable but reversible impact, mitigation measures important.
- 2000 to - 3000:	Significant impact mostly reversible after a short period, mitigation measures crucial.
- 3000 to - 4000:	Major impact which is mostly irreversible, site selection to be reconsidered.
- 4000 and above:	Permanent irreversible impact, alternative site to be considered.

Accordingly the impact score without control measures is - 2900 indicating that the mitigation measures are crucial to reduce the adverse impact.

MITIGATION MEASURES IN PROPOSED EMP

Considering the impacts described in the earlier section, the significant adverse impacts requiring mitigation are for reclamation of land; measures to control air, water and noise pollution; and provisions for compensatory afforestation and human rehabilitation. The environmental impact after implementation of mitigation measures is presented in Table 4.6 at the end of the section.

MITIGATION MEASURES FOR SOLID WASTE DISPOSAL AND LAND RECLAMATION

These are divided into two aspects as under:

Compensatory afforestation

When forest-lands are used for non-forest purposes, as per the norms of Ministry of Environment and Forests, Government of India, compensatory afforestation is required to be done is as follows:

1. where non-forest lands are available, compensatory afforestation be raised over an area equivalent to the diverted area;
2. where non-forest lands are not available it should be raised over degraded forests twice in extent to the area being diverted.

Accordingly, provision for compensatory afforestation on 283 ha of non-forest land has been proposed.

Land reclamation

The stabilization of external dump and internal dump in the quarry area is proposed to be done by stage-wise vegetative plantation on these areas. Reclamation schemes at 5-year intervals have been prepared. In addition, vegetative plantation is also proposed to be done along haul roads and in the colony.

The scheme for reclamation of land also includes the major machinery required for dumping and levelling the solid waste being disposed of.

MITIGATION MEASURES FOR AIR POLLUTION CONTROL

The proposed measures address themselves towards arresting the generation and spread of dust. These mainly include

- Water spraying on surface at blasting site before drilling, loading and unloading operations, haul road, CHP and dumps
- Provision of tarred haul roads
- Development of green belt along roads, around service buildings and in residential areas
- Stabilization of overburden dumps
- Other preventive measures.

MITIGATION MEASURES FOR WATER RESOURCES MANAGEMENT

Though there are no significant impacts identified on water resources availability, it is proposed to recycle the mine water for water spraying and application to land for watering vegetation as it conforms to the limits for this purpose.

Similarly industrial wastewater is proposed to be recycled after oil and grease removal, sedimentation etc. for vehicle washing.

As regards water pollution control it is proposed that:

- Mine water be settled before discharge into drains and bunds be constructed along the drains for further sedimentation
- Domestic and service building effluent be collected and biological treatment be given by means of extended aeration. This will ensure that effluent after treatment conforms to ISO-4764 (BOD_5 and TSS limits of 20 mg/l and 30 mg/l respectively).
- Vegetative plantation be grown on overburden dumps to prevent excessive suspended solids in surface run-off from these areas after stabilization.

MITIGATION MEASURES FOR NOISE POLLUTION CONTROL

The nature of mining activity itself is such that noise generation cannot be eliminated. Hence the control measures address themselves to preventive measures as under:

- use of noise absorbent paddings in fixed plant installations
- use of silencers/mufflers in HEMM
- use of ear-muffs by employees to reduce noise level exposure
- plantation of green-belt to create barriers between source and receiver
- location of residential colony away from noise generating sources.

REHABILITATION OF DISPLACED PERSONS

The provisions required for this purpose include the following:

- compensation for land to be acquired
- development of alternate land for rehabilitation
- provision for shifting
- compensation in lieu of earnings
- provision of infrastructure and facilities such as roads, wells, water supply and sewerage, school etc.

The Department of Coal, Government of India, has given certain guidelines for rehabilition of displaced persons as under:

1 Compensation to be paid for house and land acquired from each family.

2 House site 0.02 ha of developed plot to be given to each family.

3 Shifting allowance of Rs. 2000 to be paid per family.

4 Civic facilities to be provided in the rehabilitation colony will include water supply, power, roads and sanitary arrangements.

5. For employment, displaced persons to be given preference in recruitment to Category C and D in concerned Company subject to suitability and observance of laid down procedure of employment exchange.
6. Training to be arranged by the concerned Company for eligible persons to enable them to take up the job.

ENVIRONMENTAL IMPACT AFTER MITIGATION MEASURES

The environmental impact of the project after implementation of the mitigation measures is presented in Table 4.6. It may be observed that the project can be implemented without significant adverse impact. The impact score reduces to -425 after mitigation compared to -2900 without implementation of control measures.

COST ESTIMATES FOR ENVIRONMENTAL PROTECTION MEASURES

In keeping with the mitigation measures proposed, the major costs of capital expenditure are given hereunder. The format for presentation is in keeping with the guidelines of the Department of Environment, Forests and Wildlife, Government of India, for Coal Projects. Even if certain costs are not incurred, all items have been presented so as to give an idea of items to be considered.

COST OF REHABILITATION

Identify the following:

1. total number of families to be rehabilitated
2. number of jobs to be given to land oustees
3. additional likely demand for jobs

Capital estimation

- Compensation for land to be acquired for rehabilitation at 0.02 ha per family and Rs. 0.5 lakhs/ha for total number of families in 1 above
- Cost of development of land plots at Rs. 6000 per plot for total number of families in 1 above
- Shifting charges at Rs. 2000 per family
- Compensation in lieu of earnings at Rs. 500 per month per person for 20 years (240 months) as alternative to persons in 3 above
- Establishment of schools/hospitals/roads/well etc. in case village is rehabilitated.

  Sub-total (provision made in absence of detailed enumeration) Rs. 50.00 lakhs

COST OF COMPENSATORY AFFORESTATION

Identify the following

• Total forest land diverted	283 ha
• Forest cover (density)	0.3
• Number of existing trees removed	Under enumeration

Cost of tree	Rs. 50-4500
Cost of afforestation charged by State Forest Department in Bihar	Rs. 6200/ha

Capital estimation

Cost to revenue of land for compensatory afforestation at Rs. 0.5 lakhs/ha for 283 ha	Rs. 141.50 lakhs
Cost of existing trees	Under estimation
Cost of afforestation at Rs. 6200/ha for 283 ha	Rs. 17.55 lakhs
Sub-total	Rs. 159.05 lakhs
	+ cost of trees

Capital cost for restoration

HEMM for reclamation	Rs. 93.96 lakhs
Biological reclamation of dumps of area 227.5 ha at Rs. 28985/ha	Rs. 65.94 lakhs
Housing for reclamation personnel	Rs. 7.70 lakhs
Cost of testing/laboratory equipment	Rs. 15.00 lakhs
Sub-total	Rs. 182.60 lakhs

Capital cost for anti-pollution measures in mine and industrial area

Water sprinkler	Rs. 0.50 lakhs
Separate water tank for dust suppression, haul road	Rs. 1.20 lakhs
Environmental control measures in CHP (dust extraction/suppression)	Rs. 15.00 lakhs
Effluent treatment plant in workshop	Rs 4.30 lakhs
Surface water storage, settling tank and garland canal (diversion of drains if any in this item)	Rs. 12.92 lakhs
Arboriculture on roads and industrial area 76 ha at Rs.28985/ha	Rs. 22.03 lakhs
Cost of environmental monitoring	Rs. 2.00 lakhs
Housing for pollution control personnel	Rs. 6.60
Sub-total	Rs. 64.55 lakhs

Environmental control measures in township

Sewerage	Rs. 7.80 lakhs
Water treatment plant and distribution system	Rs. 10.72 lakhs
Storm water drainage	Rs. 3.50 lakhs
Horticulture on about 3 ha + tree guards etc.	Rs. 2.00 lakhs
Other development measures in township which improve cleanliness and aesthetics	Rs. 5.00 lakhs
Sub-total	Rs. 29.02 lakhs

Compensation for land

Compensation for acquired tenancy land of about	
12 ha at Rs 0.5 lakhs/ha	Rs. 6.00 lakhs
Sub-total	Rs. 6.00 lakhs

Cost of environmental protection measures

The capital costs of individual items have been detailed in the earlier sections. The total capital cost based on a cost index of 341 in May 1987 (reference 100 in October 1976) is Rs. 491.22 lakhs.

The cost of the existing trees has not been included in this as it is under evaluation by the State Forest Department. This cost is estimated as losses of timber, fuelwood and minor forest produce including loss of man-hours of people deriving livelihood by harvesting this produce, animal husbandry productivity, fodder and cycle, wildlife habitat and microclimate (upsetting ecological balance). As a rule of thumb, the environmental value of one hectare of fully stocked forest (density 1.0) is taken as Rs. 126.74 lakhs to accrue over a period of 50 years. The value reduces with density. The compensatory afforestation and land reclamation measures are expected to recoup this loss.

The total capital investment for the project including environment protection is estimated to be Rs. 4828.83 lakhs. It should be noted that of the 10 per cent of total cost for environment protection measures, only 5 per cent of the total cost is the incremental cost as provision for HEMM, water supply, sewerage, housing etc. has already been considered in the project cost.

Mitigation seeks to:

- find better ways of doing things
- minimise or eliminate negative impacts
- enhance project benefits
- protect public and individual rights to compensation

Understanding the problem is the key to effective mitigation.

Ask:

- what the problem is
- when the problem will occur and when it should be addressed
- where the problem should be addressed
- how the problem should be addressed
- who stands to gain or lose

Mitigation options:

- alternative ways of meeting the need
- changes in planning and design
- improving monitoring and management
- monetary compensation
- replacing, relocating, rehabilitating

Impact management plans:

- state policy and standards
- designate responsibility
- provide a schedule of tasks, including training
- allocate responsibility for tasks
- include a system of reporting
- include a system for monitoring and auditing
- contain a contingency plan

Topic 8—Reporting

Objectives

To provide a framework for the effective writing of EIA reports.

Relevance

EIA reports are designed to assist:

- ☐ the proponent to plan, design and implement the proposal in a way that eliminates or minimises the negative effect on the biophysical and socio-economic environments and maximises the benefits to all parties in the most cost effective manner;
- ☐ the government or responsible authority to decide whether a proposal should be approved and the terms and conditions that should be applied; and
- ☐ the public to understand the proposal and its impacts on the community and environment.

Timing

Two hours (not including training activity)

☑ Information checklist

Obtain or develop the following materials, as appropriate:

- ☐ copies of a range of locally produced EIA reports;
- ☐ copies of EIA reports from other jurisdictions covering the types of proposals that would be of interest to the course participants;
- ☐ any local guidelines or requirements for EIA reports;
- ☐ review procedures for EIA reports (see *Topic 9—Reviewing*)
- ☐ contact names and telephone numbers of people, agencies, organisations and environmental information/ data resource centres who may be able to provide assistance in reporting; and
- ☐ other resources that may be available such as courses in specific analytical or methodological techniques, videos, journal articles, computer programs, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives and why these are important in the EIA process.

EIA reports are designed to assist:

- the proponent to plan;
- the government to decide; and
- the public to understand

the proposal and its impacts.

1

Introduce the session by exploring with participants the various names which may be given to EIA reports, and establish the local convention for naming the report. Discuss who has responsibility for the report production.

A number of different names are used for the report produced at the end of an environmental assessment: Environmental Impact Statement (EIS), Environmental Impact Assessment report (EIA report), Environmental Assessment report (EA report), Environment Effects Statement (EES) etc. The term '*EIA report*' is used in this Topic to denote this document.

In most cases, the project proponent is responsible for the preparation of the report that follows an EIA. Often the proponent engages consultants to manage the EIA and to produce the EIA report in compliance with the terms of reference specified during the scoping phase of the process.

2

Introduce the main purposes and features of EIA reports that are common to most countries.[1]

Despite the range of names, all of these reports have the similar purpose of providing information:

- to the proponent to plan, design and implement the proposal in a way that minimises the negative effects on the biophysical and socio-economic environments and maximises the benefits to all parties in the most cost effective manner;
- to the decision-maker (government or responsible authority) to decide whether or not a proposal should be approved and if so, the terms and conditions that should be applied; and
- to the public so that they can understand the proposal and its impacts on the community and environment.[2]

In order to achieve this successfully EIA reports need to:

- be proactive documents aimed at assisting the proponent achieve good environmental design;

- have information arranged so that it is readily accessible and comprehensible to all parties; and
- clearly state the issues in a non-technical way.

Indicate that while the structure and content of the report depends on the requirements of the particular country there are a number of elements that are common to all effective EIA reports. Introduce the typical elements of an EIA report .

3 The broad structure and content of an EIA report will usually be specified in the legislation or guidelines of the country or donor. These will usually be made more specific in accordance with the terms of reference that were established during the scoping process of the EIA and any other needs of the proponent.

1 An EIA report typically addresses the items listed below. It should have:

- an executive or non-technical summary (which may be used as a public involvement document);
- description of the aims of the proposal;
- description of the proposal and alternatives (including no development). This should be brief and attention should be paid to the major differences between the alternatives;
- discussion of the relationship between the proposal and current land-use or other relevant policies for the area likely to be affected;
- description of the expected conditions (biophysical, socio-economic etc) at the time of probable implementation;
- evaluation of the impacts of each alternative with clear information on the criteria used to assign significance. Also, descriptions of the characteristics of each impact, the predictive methods and analytical techniques used, discussion of the uncertainties involved in interpreting the results and descriptions of gaps in the baseline data or other data used in the EIA work and included in the EIA report;
- comparative evaluation of alternatives covering significant adverse and beneficial impact, mitigation and monitoring measures and identification of the environmentally preferred option if possible using a set of sustainability criteria;
- impact management plan, monitoring plan and proposed training; and
- appendices: all technical information and description of approaches/methods used to provide conclusions in the EIA report should be included in Appendices if they are not suitable for the main text.

Describe the elements of an EIA report in detail. Where possible show good-practice examples of each.

Executive or non-technical summary

This is the part of the report that most people will read. It is often the **only** part of the report that people will read (including the decision-makers!). A two or three page executive summary should be written clearly and contain: 4

- title and location of the proposal
- name of the proponent
- name of the organisation preparing the EIA report
- a brief outline of the proposal
- the major impacts
- recommendations for mitigation/compensation 5
- proposed monitoring

For major proposals the executive summary might extend to ten pages but it should not be any longer. The Executive Summary can often be distributed to the public as an information brochure.

Description of the aims of the proposal

This should outline the need for, or intended aims of, the proposal.

Description of the proposal and its alternatives

This more detailed description of the proposal indicates any reasonable alternatives that would meet the proposal's need, including the possibility of the 'do-nothing' alternative. Attention should be paid to the major differences between the alternatives.

This section of the report should include:

- the status of the proposal in the project cycle such as pre-feasibility, feasibility, detailed engineering design etc; 6
- a description of planning/design and implementation strategies in only enough detail for impact forecasts and management measures to be understood and appreciated;
- the requirements for raw materials, water, energy, and equipment;
- the planned operational characteristics – its use, processes, products, etc;
- visual aids such as maps, flow diagrams and photographs;
- a comparison of proposal options (such as size, siting, technology, layout, energy sources, source of raw materials) within existing economic, technical, environmental and social constraints; and
- a summary of the technical, economic and environmental features of the proposal.

Discussion of the proposal and current landuse or policies

This section should show how the proposal fits into current systems, policies, strategies etc and whether or not it is consistent with them.

Description of the expected conditions

This is often covered in too much detail in an EIA report. Only enough detail should be given to allow an understanding of the impact analysis and assessment.

It should contain a description of the following aspects of the proposal as they are predicted to be at the time of implementation of the proposal:

- the spatial and temporal boundaries adopted for the various aspects of the study;
- the existing (baseline) condition of the biophysical, socioeconomic etc environment as well as trends and the anticipated future environmental conditions should the proposal not go ahead; and
- environmentally-sensitive areas of special or unique value (such as scientific, socio-economic, cultural, visual etc).

Evaluation of the impacts for each alternative

For both the proposal and its alternatives, the EIA report requires a description of the potential beneficial and adverse environmental impacts, both direct and indirect, for each feature of the environment identified as important during the scoping of the study requirements. This should include:

- an assessment of any impact on the local population (including gender issues);
- 7 the relevant environmental data and predictive methods used and any underlying assumptions made;
- any gaps in knowledge and uncertainties encountered;
- compliance with any relevant environmental standards and licensing procedures;
- the assessed significance of the impact, stating the standards or criteria used as the basis for judgement; and
- possible measures for avoiding or mitigating the impact.

Possible cumulative or synergistic (multiplicative) effects should also be highlighted.

The section should indicate how environmental data was gathered and the methods and criteria used to judge impact severity and significance. Wherever possible, information should be presented in summary form to help readers make a quick comparison between alternatives. One possible way to do this is to present a series of tables such as that suggested in Topic 6 — *Assessing*.

Impact characteristic summary table

Alternative No.	IMPACT TYPE		
IMPACT CHARACTERISTIC	air quality	health	etc
nature			
magnitude			
extent/location			
timing			
duration			
reversibility			
likelihood (risk)			
significance			

Comparative evaluation of alternatives and identification of the environmentally preferred option

In this section the alternative proposals should be compared, focusing on the significant adverse and beneficial impacts and mitigation and monitoring measures. The environmentally preferred option should be identified with a complete description of the following points:

- those impacts considered to be of greatest significance and the measures proposed to avoid, reduce and/or manage them;
- the impacts the proponent is committed to managing during proposal implementation, and those impacts that are residual (that is, those that cannot be avoided or minimised);
- the distribution of costs and benefits locally and regionally;
- a statement of measures for the protection and/or resettlement of affected population groups, indicating their reactions to proposals on these issues; and
- opportunities for environmental enhancement.

Impact management plan, monitoring plan and proposed training

This is the 'action oriented' part of the EIA report. It summarises the measures that have been adopted to ensure that the mitigation is implemented and the impacts are in accordance with predictions. It is a plan for monitoring and managing the impacts during implementation and operation, outlining which activities will be undertaken by the proponent and which should be the responsibility of government. Environmental management and monitoring plans should:

8

- contain a description of the proposed mitigation actions;
- contain a schedule for implementation;
- assign responsibility for implementation (by name or position of responsibility);
- present the monitoring program to assess performance; and
- present the proposed reporting and review procedures.

The plans should also outline any training needs that are required to ensure that the plans can be implemented successfully.

Appendices

Appendices contain information that may be needed for reference or for detailed review by technical experts. All technical information and description of approaches/methods used to provide conclusions in the EIA report should be included in Appendices when they are not suitable for the main text. Appendices should also contain:

- a glossary;
- an explanation of acronyms;
- 9 summary of the management of the EIA process and the public involvement including listings of individuals and agencies consulted during the EIA;
- sources of data and information and a full list of all reference material used;
- a list of the names, qualifications and roles of the team members who carried out the study; and
- Terms of Reference for the EIA and those given to individual specialists.

Describe some of the common shortcomings of EIA reports. Ask the participants to contribute examples from their own experience.

It is difficult for EIA reports to achieve the goal of being complete, easily understood, objective, factual and internally consistent. This is to be
10 expected in a process which involves so many contributors working to tight deadlines. A higher standard of reporting can be achieved if the report writers are aware of the some serious and common shortcomings of EIA
11 reporting.

The following is a list of EIA report deficiencies found in a country that has strong institutional support, and a reasonable level of funding, for EIA. The list was complied by Jules Scholten of the EIA Commission in the Netherlands.[3]

The objective of the activity is described too narrowly.
Example: The EIA report describes the transport in moving people and goods between two places only in terms of road transport neglecting the potential for rail or other means of transport.

The description of the activity does not cover the entire activity.
Example: The EIA report describes the proposed construction of an industrial plant but omits information about construction of a pipeline and other facilities to transport and handle raw materials and finished products to and from the plant.

Selection of alternatives does not take into account environmental aspects.
Example: The EIA report on a car racing circuit in a coastal dune landscape only considers alternatives meeting motor sport requirements, visitors' 'needs' and public safety regulations while overlooking environmental

considerations such as noise abatement, and the protection of geomorphology and ecology of the coastal landscape.

Key problems affected by the activity are not described.
Example: The EIA report describes the proposed construction of a coal-fired power plant using surface water as cooling medium. The EIA report does not devulge that the surface water body is already used by other industrial activities for cooling purposes to the limit of its cooling capacity.

Sensitive elements in the existing environment are overlooked.
Example: The EIA report on a pipeline project does not indicate that the proposed alignment of the pipeline will dissect certain areas of ecological value.

Environmental target values and standards are not properly described and observed.
Example: The EIA report for an extension of an airport describes the impacts up to the standard of 25 per cent of people seriously affected by aircraft noise whereas the target value aims at 10 per cent of people seriously affected.

No alternative is described complying with legal environmental regulations.
Example: The EIA report for a sanitary landfill indicates that the soil types in the area are very diverse ranging from sand and clay to peat. The alternatives do not take into account the large differences in compaction and subsidence of these soil types with subsequent failures of underlinings and drainage systems underlying the landfill.

Possible promising mitigating measures are not considered.
Example: The EIA report for a sanitary landfill does not describe a system for collecting the methane gas produced in the landfill. Methane is a greenhouse gas contributing to global warming.

The alternative offering the best protection to the environment is not described or is insufficiently described.
Example: The EIA report on a bridge or tunnel connection across an estuary does not take seriously the alternative whereby the connection is carried out as a drilled tunnel. A drilled tunnel underneath the bottom of the estuary has considerably less impact on the environment than a bridge connection or a tunnel composed of segments on the bottom of the estuary.

Serious impacts on the environment are not described or are not correctly described.
Example: In the case of the EIA report for a sanitary landfill in an area with very variable soil conditions the EIA report does not describe the impact on the environment following failure of the underlying sealing and drainage systems.

Insufficient or outdated prediction models are used.
Example: The EIA report on an urban development scheme makes use of a mobility prediction model using national averages whereas local input data is available enabling a more precise prediction.

Environmental impacts are not compared with standards or target values.
Example: See the case of the EIA report on the airport extension where the target value of 10 per cent of people seriously affected is not described.

In comparing the alternatives, incorrect conclusions are drawn.
Example: In the EIA report on a regional management plan for the disposal of municipal sewage sludge various alternative methods for disposal are compared. One alternative concerns composting the sludge into a low grade compost product. The comparison of the alternatives in the EIA report presents the composting method as an attractive form of disposal as it greatly reduces volume. However, the comparison does not take into account the limited potential for applying the low grade compost as a soil conditioner or improver due to high heavy metal contents in the sludge.

Outline some general guidelines that will help to ensure that the preparation and production of the report is successfully accomplished. Ask the participants to add to these guidelines based on their own experience.

EIA reports are most often the products of a team. This is because most proposals have a number of potential impacts (biophysical, socioeconomic, health etc) and require a range of expertise to analyse them. A team leader (usually identified as the Project Manager) has responsibility for bringing together this interdisciplinary team and for managing its work. A more detailed description of the Project Manager's role in the production of an EIA report can be found in Topic 12—*Project Management.*

If the report is to effectively communicate the conclusions and recommendations of the impact assessment it must be written in a way that makes it accessible to:

- local people (and particularly those affected by the proposal)
- interest groups
- decision-makers

It should be brief, illustrated with good quality maps, charts and diagrams and have these materials captioned so that their significance is obvious.

The writing (particularly of summaries) should be clear and easily understood by people without a technical background. Summaries are important. They are often the only section of the report read by the public and they need to include all significant findings. They should not, however, attempt to summarise the whole content of the report. This poses the problem for the reporting team of finding clear, short expressions of often complex arguments and recommendations.

Distributing the report

The arrangements for making EIA reports available to the public and for encouraging public input differ according to legislative and administrative requirements. As a general guide, the report should go not only to proponents, government officials and decision-makers, but also to anyone who can register a legitimate interest in the proposal. In most cases the executive summary material is particularly useful to distribute to those who don't want to read the whole document. It can also be easily translated into other languages.

If formal public consultation has occurred in the time between scoping and the production of the report it may be useful to have a section showing comments received and responses to these comments.

Other forms of presentation

Other forms of presentation of the findings should be also be considered such as:

- local language video
- local radio and television
- presentations
- newsletters, information sheets
- displays, particularly if they are supported by members of the EIA team
- gatherings based on local community groups
- meetings (small) and workshops

All have their place in good communication but none can be effective without the preliminary work involved in producing a clear and comprehensive report, factually accurate and consistent in its data.

Make a brief reference to the fact that a report for a Strategic Environmental Assessment could follow similar lines but with more emphasis on identifying generic alternatives and less emphasis on the detailed analysis of individual impacts.

Include a training activity to reinforce the topic (if desired).

Conclude by summarising the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Biswas, A and Qu Geping (1987) *Environmental Impact Assessment for Developing Countries*. Tycooly
2. Boyle, J and Mubvami, T. (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe*. Department of Natural Resources Ministry of Environment and Tourism. Zimbabwe
3. Scholten, J. (1995) *Reviewing EISs/EIA Reports*, Report of the EIA Process Strengthening Workshop, Canberra

Further reading

Bendix, S. (1984) How to Write a Socially Useful EIS. In, *Improving Impact Assessment: Increasing the Relevance and Utilization of Scientific and Technical Information*. Ed. Hart, S. L., Enk, G. A., Hornick, W. F., Jordan, J. J. and Perreault, P. Westview Press. Boulder, Colorado. Chapter 13

Bisset, R. (1996) *EIA: Issues, Trends and Practice*. The Environment and Economics Unit UNEP. Nairobi

OECD/DAC (1994) *Towards Coherence in Environmental Assessment: Results of the Project on Coherence of Environmental Assessment for International Bilateral Aid*. vols 1,2 and 3. Canada

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Wood, C. and Dejeddour, M (1992) Strategic Environmental Assessment: EA of Policies, Plans and Programmes. *Impact Assessment Bulletin*. 10(1):3-22

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

8–1 How can EIA reports be restructured to make them more proactive in producing environmentally sensitive design?

8–2 Why is an EIA report written? How can the style of presentation be improved to better suit the needs of decision-makers and others who read the report?

8–3 What can be done to improve the objectivity of EIA reports?

Speaker themes

8–1 Invite a speaker who is experienced in reviewing the quality of EIA reports to discuss the strengths and weaknesses of a range of existing reports.

Group Activity 8-1: Reporting

Title	**Writing executive summaries**
Aim	To guide participants in writing concise and relevant summaries of EIA reports.
Group size	Individual exercise
Duration	Half-day. (The EIA reports should be handed out well before the activity commences, preferably at registration, so that there is time for them to be read by participants.)

Resources required

- ❑ An EIA report for each participant, preferably with the executive summary removed and available for inspection later; and
- ❑ a handout describing the key elements of an executive summary that would be appropriate for the local process.

Description of activity:

- ❑ The participants should have already read the EIA report. They are to produce an executive summary that is not to exceed four pages (about 1500 words).
- ❑ Participants can compare their summary with the one written for the report and analyse which summary better meets the needs of the decision-makers, the public and the proponent.

Group Activity 8-2: Reporting

Title	**Producing an impact management plan from an EIA report**
Aim	To assess the adequacy of the report as a basis for managing and monitoring the impacts of a proposal.
Group size	Pairs
Duration	Half-day. (The EIA reports should be handed out well before the activity commences, preferably at registration, so that there is time for them to be read by participants.)

Resources required

- An EIA report for each pair of participants

Description of activity:

- The participants are to review the EIA report to determine the range of activities and impacts that require management and monitoring.
- From this they can attempt to produce an environmental impact plan noting any inadequacies in the EIA report.
- Conclude with reporting back of groups to the group as a whole and a discussion summarising the activity.

Group Activity 8-3: Reporting

Title	**Decision-making based on the EIA report.**
Aim	To use the executive summary of an EIA report as the source of information in decision-making.
Group size	Groups of two or three
Duration	One hour

Resources required

- EIA report summaries

Description of activity:

Provide each group with the executive summary from an EIA report, and get them to:

- make a decision on the future of the proposal based on the summary provided;
- detail what conditions they would place on this decision;
- list what further information they would have requested if they had been able to; and
- conclude with short whole group discussion.

Different names for the same document:
- Environmental Impact Assessment report (EIA report)
- 1 Environmental Impact Statement (EIS)
- Environmental Assessment report (EA report)
- Environmental Effects Statement (EES)
- Local usage: *Trainer to enter local terminology*

Effective reporting:
- assists the proponent to plan
- 2 assists the decision-maker to decide
- helps the public to understand

Main elements of an EIA report:
- executive summary
- 3 aims of the proposal
- description of proposal and alternatives
- relationship to current land use policies
- description of expected conditions
- evaluation of impacts
- evaluation of alternatives
- impact, monitoring and training plans
- appendices

Producing an executive summary:
- keep it short (3 to 10 pages)
- 4 make it clear
- avoid jargon and any terms not defined in the summary and which could be misinterpreted
- consider the needs of local readers as well as those of decision-makers
- include all significant findings
- check for accuracy and consistency

EIA report executive summary:
- proposal title, description and location
- 5 name of proponent
- name of organisation preparing the EIA report
- outline of proposal
- major impacts
- recommendations for mitigation/compensation
- proposed monitoring

EIA report - description of the proposal:
- status of proposal
- 6 planning, design and implementation strategies
- requirements for materials, water, energy, equipment
- planned processes and products
- visual aids (maps etc)
- options (eg. siting, layout)
- summary of technical, economic and environmental features

7

Evaluating impacts for each alternative

- assessment of impact
- data and predictive methods used
- uncertainty and gaps in knowledge
- compliance with standards (guidelines)
- criteria used to assess significance
- proposed impact avoidance or mitigation

8

Impact management, monitoring and training plans:

- describe proposed mitigation
- contain schedule for implementation
- assign responsibility for implementation
- detail a monitoring program
- detail proposed reporting and review procedures
- detail proposed training

9

Appendix materials:

- technical information
- glossary
- acronyms
- summary of public involvement program
- sources of data and references
- details of study team
- Terms of Reference

10

Some common shortcomings of EIA reports:

- object of activity described too narrowly
- description does not cover complete activity
- alternatives do not account for the environment
- key problems not described
- sensitive elements in environment overlooked
- standards and legislation are not described or alternatives do not comply with them.
- some mitigating measures not considered

11

Other common shortcomings:

- best alternative not described (or insufficiently described)
- serious impacts are not mentioned or not correctly described
- outdated or ineffective prediction models used
- impacts are not compared with standards or targets
- incorrect conclusions drawn

Main Elements of an EIA Report

- executive summary
- aims of the proposal
- description of proposal and alternatives
- relationship to current land use policies
- description of expected conditions
- evaluation of impacts
- evaluation of alternatives
- impact, monitoring and training plans
- appendices

HOW TO WRITE A SOCIALLY USEFUL EIS

Selina Bendix

In: *Improving Impact Assessment: Increasing the Relevance and Utilization of Scientific andTechnical Information*. Ed Hart, S.L., Enk, G.A., Hornick, W.F., Jordan, J.J.and Perrult, P. Westview Press, Boulder, Colorado. Ch. 13

The intent of the National Environment Policy Act (NEPA) is to improve the governmental decision-making process by providing a broad and relevant information base as input to decision makers. This information is to be presented in the format of an Environmental Impact Statement, or EIS. An EIS can be the basis for a good decision, which does not solve a present problem only to create a more difficult future problem, or it can be a futile exercise in paper shuffling. Most EISs fall between these good and bad extremes. The purpose of this paper is to discuss how to write an EIS that is useful both to the decision maker and to the concerned citizen. The suggestions can also be used as a guide to the review of EISs.

In writing an EIS, as in writing anything, it is important to consider your audience and what you want them to do with the information you give. The greater your expertise in your field, the more important it is for you to break out of your own mental framework and don the hat of your reader. It does not matter how "right" you are; if the information is not communicated to your audience, what you write is useless.

Dealing with a controversial issue can be nerve-wracking for all concerned. Do not let this paralyze your thinking: the more controversial an issue, the more important it is that all parties have accurate information. A good EIS helps people to cut through emotions and rhetoric to form opinions and make decisions based on fact. I shall attempt to give guidelines that can be used to create a cogent, concise EIS presented in a manner conducive to use, rather than to the collection of dust on a shelf.

Many of the examples in this paper are derived from my six and a half years of experience as San Francisco Environmental Review Officer. In the year since I left that position to become a private consultant, I have continued to find it useful to follow my own advice.

Who is your audience? You're a biologist who has surveyed the biota on the site of a proposed power plant. You know that the California Department of biologists at Fish and Game are going to read your report carefully, so you write your section of the EIS as one professional to another, right? Wrong.

In the process of proving to the Fish and Game biologists that you are a competent biologist worthy of their trust, you have written something appropriate for a professional journal, but you have become unintelligible to the members of the community activist group opposing the power plant, the city council members who would like to be able to have an informed opinion and to be able to decide whether to approve the plant. None of these people are biologists. Not only do they not understand the biologists' technical terminology, they do not even know the biology that biologists take for granted when talking to each other. You have to give the reader enough information to allow him or her to judge the validity of the biologist's conclusions.

Some of your readers do not trust you; they suspect that you have been bought out by one side or the other. Other readers think that biologists are all a little nutty and do not have their priorities set up with the real world in mind. You have to convince all the doubting Thomases that there was a good reason to do a biological survey of the site, that this survey was undertaken in a rational and efficient fashion, and that your conclusions are reasonable. In other words, you have to give the reader some insight into the logic of your specialty. Interestingly enough, you will not lose Fish and Game in the process; they will like this type of a presentation, too, even though it would not be appropriate for a professional journal.

I commented on behalf of the City and County of San Francisco on a U.S. Bureau of Land Management (BLM) 1974 EIS:

> In the section on the use of coal, it says "recoverable reserves of coal include at least 28 billion tons of 1 percent or less sulfur content" (page 365). There is no explanation of what the significance of this level of sulfur content is. I presume, therefore, that the assumption is that the reader knows whether this represents a high, low, or a medium sulfur content, and what the significance of varying sulfur content of coal is for the environment. There is certainly no information in the document to enable the reader to understand the significance of this statement.
>
> The general public does not have a technical education. Many portions of this document I doubt could be comprehended by a person without a technical education. Terms such as "purse seining" - page 13, "gill netting" and "surface jugs" - page 16, "urban impacted area" - page 28, "safe profiles" - page 174, ."industrial groundfish" - page 269, "sour crude" - page 369, "heat wheels" and "heat pipe" - page 383, and many others are found throughout this document without any definitions.
>
> Consider the following sample sentence from page 193: "In this paper Sanders concluded that species density patterns for polychaetes, gastropods, bivalves, and ampeliscid amphipods which are residents of the subtidal benthos, exhibit stress patterns dependent on distance from the spill and time of exposure of organisms to the fuel oil." I wonder how many readers of this document are going to be willing to go to a dictionary to look up the number of terms in that one sentence they are unfamiliar with?
>
> An EIS is not supposed to be written as a statement from one technical expert to another. It is supposed to be an explanation of technical issues to nontechnical people who must be involved in the decision-making process. If the technical language is not translated into lay language, then this objective of the EIS is not attained. (Bendix, 1975)

Think of your audience as ignorant of your field but vitally interested - they are, if they have an opinion about the project. Assume that they have never been exposed to anything more than junior high school science, even if they are professionals in their own right. Do not write as if you think your audience is stupid. The reader badly wants your information (at least some of the readers do); you just have to give it in a form that will be useful. If you want to get a good sense of whether you are writing for the right audience, ask your secretary to read ten pages and point out every passage that is obscure. Or ask a teenager to read it. One of the reasons that I always have student interns in my office is that they are good test subjects for EIS language. If an intern does not understand a passage, I rewrite it.

All technical terms do not have to be left out; when used, they do have to be explained. The same is true of acronyms. If acronyms are to be used frequently, it helps to put a list at the front of the EIS. A list like this is also a help in telling you when there are too many acronyms. In one case, I found a "helpful" list of two full, single-spaced pages of acronyms at the beginning of a preliminary draft Environmental Impact Report for a sewage treatment plant. (Environmental Impact Report, or EIR, is the equivalent of an EIS under California's little NEPA law, the California Environmental Quality Act, CEQA.) It was obvious that this was acronym overkill, and I asked the consultant to cut the list.

Particularly watch out for similar or identical acronyms for two organizations. I know when ACS means American Chemical Society and when it means American Cancer Society; I find that my audiences do not. I think of AIA as American Institute of Architects; to my husband it is the American Insurance Association.

A similar problem can arise with the term "master plan." In San Francisco we have the Comprehensive Plan for the City and County of San Francisco, usually known as "the master plan" to all engineers and administrators dealing with it. We also have numerous "master plans" for hospitals and educational institutions as required by our institutional master plan ordinance. They are all known as "the master plan" to the staff of any particular institution. We had total chaos in environmental documents until I established a rule that only the Comprehensive Plan for the City and County of San Francisco could be referred to as "the master plan." All of a sudden, passages about compliance of something like the wastewater master plan with the city's master plan became intelligible.

Environmental Impact Reports for San Francisco's wastewater master plan (11 certified, 3 in progress) have provided an ongoing challenge of explanation of sewage treatment to a non-engineer audience. These are some examples of how this has been handled:

> After pretreatment and flow measurement, the influent would flow to primary sedimentation tanks, which retain the wastewater long enough to allow for about 60 percent of the suspended solids to settle by gravity to the bottom of the tanks. These settled solids (sludge) would be slowly scraped along the bottom of the tanks to a collection trough, or sludge gallery, from which sludge would be pumped to a storage area…
>
> The proposed secondary treatment method would use rotating biological contactors… The facility would consist of banks of 12-foot diameter plastic disks, the contactors, which slowly rotate, half-immersed in tanks of wastewater. Microorganisms (bacteria, algae, protozoa, fungi, etc.) would attach themselves to the plastic disks and consume the organic matter in the wastewater. Aeration of the wastewater and direct exposure to the air as the disks revolve would provide oxygen for the organisms on the disks…
>
> It is feasible to control wastewater treatment plant odor emissions, as actual applications of such technology at the main plant in Sacramento and at a plant in Honolulu have shown. Even with such control, the potential would still exist for malodorous gases and aerosols to be emitted from the Southwest Water Pollution Control Plant site. Such emissions could occur either through accidental spillage of sewage or grit screenings, failure of the secondary treatment units (due to illegal or accidental introduction of toxic material into the sewer system), failure of the odor control system to adequately remove malodorous gases, or total upset of the odor control systems (e.g., through electrical failure). (City and County of San Francisco, 1979)

A variety of specialized experts in fields such as archaeology, botany, chemistry, economics, invertebrate zoology, meteorology, sanitary engineering, urban planning, and so forth may contribute to an EIS. Every EIS team needs someone who can edit all of this specialized input into a text that reads as if written by one author. This editor is just as important to the team as the sanitary engineer, maybe more important. If the information in the EIS is not usable, the engineer's expertise is irrelevant.

Reflect controversy in document organization. A good way to annoy the antagonistic citizen or the legislator whose office has been besieged by phone calls is to bury the impact that is of most public concern after one hundred pages of impacts over which there has been no evidence of public interest (even if you think there should have been concern). If people are up in arms over the architectural merits of a building proposed to be torn down to make way for something else, the reader's mental temperature simply goes up if pages of materials on the geology and air quality of the site must be plowed through before reaching the discussion of the architectural merits of the building and the reasons that the building is not being retained.

Standard outlines are cherished by some agencies as a means for quick review of documents and by some consultants as a fast way to write EISs, but they are not a good means of implementing the intent of NEPA. The nature of the project and the significance and controversiality of impacts determine the format best designed to lay out the facts about each particular case. If an impact seems important to you as an agency person and the public has not recognized the importance of this impact, give the reader the information about the controversy that got him or her interested in reading the EIS. Then, when you have convinced the reader that the document is a reliable source of information, educate him or her to understand the other important impacts.

The table of contents is the place where the reader starts forming a reaction to an EIS. I can tell a lot about an EIS by reading the table of contents. I look for what I predict to be the most controversial impacts; if they are after page 100, the EIS is probably windy or trying to bury important information. For example, in a radar installation EIS, I looked first for an analysis of the controversial question of the biological effects of microwave radiation. So did the U.S. Department of Health, Education, and Welfare, Center for Disease Control, which commented on the Crossman Peak Radar proposal in Arizona:

> The potential occupational and public hazards associated with the proposed facility should be addressed in more detail. While the proposals' electromagnetic radiation hazards are discussed in Appendix 2, it may be desirable to include a short discussion of the potential radiation hazards in the body of the EIS with a better depiction of the immediate areas around the antenna that are exposed to the radar beam. The probability of equipment malfunction and exposure of maintenance personnel at the facility to excessive radiation should be discussed. (U.S. Bureau of Land Management, 1980)

Unfortunately, the agency response was:

> The scoping process did not identify radiation hazards as a significant issue, and FAA engineers indicated that such hazards would be reduced to a low level through safety checks designed into the system. We thus did not deem necessary further discussion in the EIS.

Needless to say, this constitutes a misinterpretation of the intent of the President's Council on Environmental Quality (CEQ) regulations. Impact significance is not a function of the ability to recognize the impact at the time of scoping. The scoping process cannot be perfect because something unforeseen may always turn up as a proposal is investigated; but scoping is a good way of preventing overkill with extensive, trivial information masking the important facts. It is a good weapon against the syndrome of "I put it in because I had the information."

It is frustrating for an agency to receive comments on a draft EIS that say, "This project is going to have disastrous environmental impacts that you have not adequately considered, period." What can one say in response? If you give enough information about issues that are controversial in the affected community and present it well, you will turn the vague, unfocused EIS comments into more specific comments on the analysis of specific impacts - these are much easier to answer and constructively add to the dialogue about the project.

In urban project EISs, I look for the sections on transportation, air quality, and noise impacts because traffic produces most of the post-construction air and noise impacts. If they are separated by other unrelated sections or if noise comes before the traffic that produces it, then I decide to watch carefully for logical faults in the analysis. It pays to be kind to your reader; you get fewer nasty comments.

A recent California final EIR (Department of Mineral Services, 1980) lacked: page numbers in the table of contents for the subheadings (noise, traffic, socioeconomics, etc.) in a 40-page impacts chapter; the address and telephone number of the lead agency; and page numbers and titles for several of the more important tables. The EIR actually contained much useful information that the casual reader would find only by chance and that a decision maker might never find. The difficulty of finding things in this document was so annoying that it became a game to find all the things the authors had done wrongly. This, of course, resulted in extensive comments. The agency involved would have been better off if the staff time that went into responding to voluminous comments had been spent on putting out a better draft EIS.

The whole is greater than the sum of the parts. According to Webster (1957), "piecemeal" means "(1) piece by piece ... (2) into pieces or parts." My name for the practice of breaking up a single project into sections with separate EISs, without a program EIS for the whole project, is "piecemealing." Piecemealing at best results in losing sight of the forest in preoccupation with individual trees; at its worst, it is a device to avoid in-depth environmental review. There are many temptations in piecemealing because the smaller the scope of the EIS, the easier it is to be sure you have thought of everything, the smaller the probable number of concerned public groups affected, and the less expensive and time-consuming the environmental review process.

These advantages may be illusionary, as the current Hartford, Connecticut, to Providence, Rhode Island, Interstate 84 situation demonstrates. The U.S. Department of Transportation (DOT) planned three EISs and one or more supplemental EISs for this highway. They apparently thought that piecemealing would allow them to approve and design one part of the highway while another part was still undergoing NEPA review. On December 13, 1979, the U.S. Environmental Protection Agency (EPA) formally referred this matter to CEQ.

According to a CEQ legal memorandum (Liebeman and Yost, 1980), EPA's principal concern was that construction of I-84 on the conditionally approved alignment would increase traffic over the Scituate Reservoir and through its watershed, which would increase the risk of hazardous spills and degradation of the watershed. This reservoir is the sole source of drinking water for approximately half of Rhode Island. Alternate routes are available.

> EPA has recommended that CEQ request DOT to rescind approval of the final EISs for the Connecticut segments and prohibit any design work until DOT has completed the new EIS for the Rhode Island segment on alternative corridors and a single EIS on the entire highway from Hartford to Providence. (Liebeman and Yost, 1980)

On April 30, 1980, CEQ replied to the EPA referral, stating,

> The Department's "conditional" approval of two Connecticut segments of I-84 poses two serious issues. Either the approval is indeed so open and contingent on the completion of the EIS process that the Department is willing to waste $16 million in design work and forego $54 million in expected savings without prejudice to the final

> decision or the decision is made for all practical purposes, and the remaining EIS process in Rhode Island and Connecticut is badly compromised. In our view, the former situation is not credible, and the latter is not legal. (Speth, 1980)

Beware of setting a singular study perimeter. To keep from confusing people you should have a single study area for all impacts investigated, right? Wrong. If you set a single study area, you will inevitably have unnecessary information about some study perimeters and you may have insufficient information about others. For example, the transportation and air pollution impacts of a freeway may be regional, while the noise impacts are confined to a narrow corridor along the roadway.

Problems in defining the study area have occurred in several recent San Francisco EIRs for downtown high-rise buildings. San Francisco has prevailing off-shore winds from the northwest. When these winds sweep across an area with relatively low buildings and little relief and then hit a tall building, the air swirls down the front of the tall building to form high-speed eddies at the base of the building that are unpleasant to pedestrians. In order to prevent this from happening, San Francisco requires wind tunnel modelling and design mitigation if necessary, a practice I recommend to other urban areas.

The consultant handling the wind tunnel modelling had a rule of thumb for the size of the area around the building in which impacts could be expected and set up the study perimeter accordingly. When the completed reports on several projects came to me, I discovered that wind speeds were still statistically significantly above background at spots on the perimeter of the study area. This left me not knowing how far from the site the impact would be felt. Of course, I had to request that additional studies be done, at a cost considerably above the cost of getting those measurements initially.

When the details of a project are still fluid, solve the indeterminacy problem with a worst-case analysis. For example, pick the noisiest element of the project, such as pile driving for foundations of tall buildings, and determine the perimeter of the area in which this noise level would be audible above background, paying particular attention to sensitive receptors such as hospitals, schools, broadcast studios, and residences. It is often helpful to map the area where the noise will be audible. People want to know what is going to happen to them; each reader will look at the map and find out if the impact will be perceptible at the reader's home or place of work. An informative map prevents many phone calls from people who want to know if they will hear the construction noise. Information about noise increases imperceptible to the human ear or lost in the general ambient noise background is useless and unnecessary.

You might think that the scoping process should take care of setting reasonable study perimeter limits, but often it cannot set physical limits because data developed in the process of analysis of impacts will determine the logical location of the study perimeter. What can be done in the scoping process is to delineate what measure of significance will be used to determine the study perimeter, for example, the area of greater than 10 percent change for traffic. In some cases, of course, perimeters can be established in advance - for example, on the basis of known habitat preference of a plant.

Respond to concerns of the ignorant. The ignorant vote, too! Just because you (or your geologist or structural engineer) know that a slope is stable, and cannot slide if something is built on it, does not mean that the home owner next door knows this. Just because you know that an off-shore earthquake fault just waiting to let go is one of a type that cannot produce tidal waves does not mean that the concerned citizens along the shore know it. If you do not explain the nonexistent problems that people are worried about, they will not listen to your explanations about the real problems.

In San Francisco we had a case in which the attention of the decision makers was captured by public concerns about the effects of a major earthquake along the San Andreas Fault on a proposed project. These concerns were presented by an eloquent medical doctor who was reasoning from false assumptions that none of the decision makers knew enough to recognize. Before attention could be focused on the real merits of the case, it was necessary (1) to explain surveying bench marks and explain why all measurements to be added and subtracted must be made with respect to the same bench mark to have any meaning, thus explaining why the unlikely event of a tidal wave would not inundate the west side of the city, and (2) to draw a diagram to explain that, if the surface of the water table cracks as the result of an earthquake, groundwater will go into the sewer rather than sewage flowing out of the crack. The civil engineers were aghast that any intelligent adult could not know such things. The decision makers were intelligent; they simply had never had need to think of such things until a controversial sewer proposal was before them. After they understood why the nonexistent problems were nonexistent, they were ready to proceed to the real problems.

It is particularly important to document carefully issues about which people may have formed definite opinions without realizing how little they knew. In such situations, it may be very difficult to change people's minds, no matter how wrong they are. This problem has been extensively studied by Slovic and Fischoff (1979), who have stated,

> The psychological basis of ... unwarranted certainty seems to be people's insensitivity to the tenuousness of the assumptions upon which their judgments are based ... The danger from such overconfidence is that we may not realize how little we know and how much additional information is needed about various problems and risks we face.
>
> Overconfidence manifests itself in other ways as well. For example, a typical task in estimating failure rates or other uncertain quantities is to set upper and lower bounds such that there is a 98 percent chance that the true value lies between them. Experiments with diverse groups of people making many different kinds of judgments have shown that, rather than 2 percent of true values falling outside the 98 percent confidence bounds, 20-50 percent do so (Lichtenstein, Fischoff, and Phillips, 1977). Thus people think that they can specify such quantities with much greater precision than is actually the case . . . . One way to reduce the anxiety generated by uncertainty is to deny the uncertainty.

It may not, in fact, be possible to change the minds of some people who have formed opinions on the basis of inadequate or misunderstood information. The only chance you have is if you present a good argument logically and understandably. Remember that each member of your audience thinks that he or she is just as logical as you are. If you think of your audience as reasonable, intelligent people who will do the right thing, you have a much better chance of convincing them than if you think of them as unreasonable opponents. People sense what you think of them in the way you write. Do not try to write when you have just finished a telephone conversation with someone who was very angry and did not want to be confused with facts. Your hostility will show. Wait until you have recovered to the point of seeing the situation as humorous and challenging; what you write will then be more constructive.

One of the challenges to EIS writers is capturing readers' attention when most people are convinced that the only alternatives are to build or not to build a particular alternative. This is easier to handle orally than in writing. Strategies that can be used to focus attention on the development of real alternatives include the following: (1) tell the project sponsor that with so much (agency) (public) opposition it is a good idea to have a fall-back position; (2) tell opponents that if they are right, that the project sponsor never seriously considered alternatives, then surely these opponents can define alternatives for consideration for inclusion in the EIS and tell the sponsor that, if all the alternatives are ridiculous, a fair analysis will demonstrate this and make clear why the proposed alternative was selected; or (3) tell project opponents that it may be politically impossible to turn the project down and, therefore, they should concentrate on what could be done to the project to minimize its impacts. The basic idea is to try to get everyone to work with you to develop the best possible information base, mitigation measures, and so on. When you make an effort, you can redirect a lot of real or potential antagonism into constructive cooperation.

Do not present mitigation measures as a wish list. "Coulds" and "mights" use up a lot of space and leave the reader in limbo. The mitigation portions of EISs are often the most unsatisfactory because the reader cannot tell which measures are, in fact, to be implemented. Every mitigation measure should indicate one of the following: (1) the measure has been incorporated into the proposed project; (2) the measure is under consideration and a decision will be made at a stated time on the basis of stated criteria; or (3) the measure must be implemented by another governmental agency that will or will not be requested to look into the matter. Now the reader knows what will and will not be done and can consider the necessity of requests for further mitigation as a condition of approval. The sponsor's reasons for not adopting a mitigation measure can be evaluated for validity, and the necessity for additional information in order to judge whether certain mitigation measures should be imposed as a condition of approval can be assessed.

Decision makers do not have a lot of time to consider each case. Mitigation measures and alternatives are often the crux of the decisions that must be made. If you as staff think that the reasons for rejecting a mitigation measure are not valid, lay out the facts that brought you to this conclusion. If you feel this way because of valid reasons, not just because the sponsor was unpleasant to deal with and you would like to see him or her suffer for it, the facts should convince the decision maker that you are right. Do not be afraid when the sponsor sees the facts differently from the way you do. Give the facts according to the sponsor; then get an independent review and give the conclusions of your construction consultant on the costs of implementation, or other similar action. Stating both sides is fair to the reader and allows the reader to decide which side is right.

Specify the degree of statistical validity. (How good is your crystal ball?) The writer of an EIS must often make predictions using a relatively small information base. However, what is "relatively small" to the professional who wants to make a statistically valid prediction may be a surfeit to the decision maker. According to Robilliard (1977), "many will be overwhelmed by the amount of available knowledge but surprised at the lack of firm conclusions, and consequently may ignore the whole ecological issue as much as possible."

Much excess EIS length arises from a subconscious fear of making decisions about what to include and what to leave out. In the end there will not be enough room for every potentially relevant piece of information; so it is much better to confront these fears sooner rather than later. Be courageous and eschew the verbal "squid effect" in which the real issues are beclouded by an excess of verbiage.

I was once chided by a consultant for editing his submission to make it, in his view, "incomplete." He assured me that I was running the risk of legal challenge for incomplete coverage because in an EIR for a high-rise office building in the middle of the San Francisco financial district I would not allow discussion of the question of the existence of economically interesting mineral resources under the street. Even if there had been any, two levels of subway would have been in the way of recovery. Short of diamonds, I doubt that the site would have been considered a potential mine - and even with diamonds I still have my doubts. It was a waste of space for him to have included the issue.

Transportation planners would like to know a great deal of detail about where the cars attracted by a major project will go. Determining this requires the use of many assumptions. Traffic projections start out with a percent probable error of traffic counts and accumulate uncertainty as assumptions are made. There is not much point in pursuing such calculations when differences of 2-5 percent are showing up and you know that the probable error is in excess of 10 percent. The perimeter for such calculations should be the area where a difference of more than 10 percent in vehicle trips could occur. If the traffic impacts are of great concern, then worst-case assumptions that are carefully spelled out should be made. In this way, it is possible to say the impact could not be greater than so-and-so much, and probably would be less.

It is necessary to indicate the mathematical limits of prediction methodology. There is too little use of statistical analysis in EISs. This is indispensable in explaining what is a significant predicted increase in pollution and what is not. It is difficult for the decision makers to understand that statistically insignificant increases in air pollution due to each of a series of unrelated projects may result in a cumulatively significant effect on air pollution, but this is something they have to grapple with if they are going to make good decisions.

On the other hand, do not let people push you into making predictions that you know are meaningless. It would be simpler for the decision makers if staff and/or consultants had a good crystal ball to read the future so that decisions would not have to be made in the presence of uncertainty; however, life is just not that simple.

A common problem is presented by small-scale impacts that are not subject to statistical behaviour even if baseline data are obtainable. In San Francisco, for years we had requests for prediction of the socioeconomic effects of the construction of single, small apartment houses (four to ten units) in predominantly single-family and duplex neighborhoods where impacts over a two or three block radius from the proposed project site were of concern. We finally convinced people that there was no statistically valid means of prediction from such a small information base and that any such predictions would simply be misleading.

Another facet of the problem of statistical reliability arises from the handy, small calculator. There is an abundance of information in EISs now given to four to eight significant figures - whatever the calculator happened to be set to read out. That looks very nice and reassuring until one realizes that these results were calculated from input data having only two significant figures. Not only are results with more significant figures than the input data had to start out with mathematically meaningless; they mislead the reader into thinking that much more is known than is actually the case and give a false illusion of security to the decision maker who does not realize the degree of uncertainty of the data. They also irritate the mathematically alert reader, who may then be inclined to distrust the rest of the document.

Do not ask the reader to accept your statements on faith alone. "The change in noise level would be minor;" "the amount of sewage produced would be insignificant" - why should the reader believe unsupported assertions? Remember that the accident at Three Mile Island has confirmed distrust of experts in many minds. Whenever you can, give people enough information to come to the correct conclusion on their own. "There would be a 3 dBA increase in ambient noise level 100 feet from the project; the threshold for human perception of noise difference is 3 dBA" or "the proposed project would cause a 0.01 percent increase in the flows to be treated by the sewage treatment plant that serves this area" are preferable. The reader can come to the correct conclusion without worrying about the reliability of the expert and you avoid arguments over opinions of magnitude of importance. For example, is elimination of parking a positive or negative impact? If you want to park in the area, it is a negative impact. The label for the impact depends on your framework of reference. Nothing in NEPA says that you have to label an impact "positive" or "negative" until you reach the "unavoidable adverse impacts" section. A good strategy is not to use positive and negative designations on impacts until this section. At this point, the reader can match independent conclusions with the agency's and decide if the two are in acceptable agreement.

An EIR prepared by the California Department of General Services (1980) contains an "environmental matrix" that labels all impacts as "beneficial," "none," "minor adverse," or "major adverse." Under "labor force" I found "major adverse" checked. In the chapter on environmental impacts and mitigation measures, the only reference to labor force that I could find was the following paragraph:

> Employment: The Western Addition Project Area Committee (WAPAC) has expressed concern about whether or not local workers will be employed by the State's contractor during construction of the State Building. The Committee has asked the State to enter into an agreement in compliance with the Redevelopment Agency's 50 percent low-income area residency hiring goal, whereby the construction contractor would employ 50 percent of his workers (on a craft-by-craft basis) from low-income residents of the Western Addition area. The State has agreed to do so.

I am still wondering what the major adverse impact is.

A U.S. Bureau of Reclamation (1977) EIS for an electrical transmission line listed herbicides that would be used for vegetation control in the right-of-way; they included aminotriazole, maleic hydrazide, and simazine, which are all carcinogenic in mice and rats. The entire evaluation of impact was one sentence: "these herbicides will be applied in minimal amounts so that they will not leach into the ground water, which averages 50 to 100 feet below the surface." These herbicides are described as "plant specific." This turned out not to mean what I would call "specific." Chloroflurecol "retards many grasses and controls broadleaf weeds and vines." Glyphosate "for control of many annual and perennial grasses and broadleaf weeds plus many tree and woody brush species . . . is nonselective" (Meister, 1980). If this is "specific," then I wonder what "minimal amounts" are?

How big is large? The previously mentioned California Department of General Services (1980) EIR contains the statement, "large trees, shrubs, and ground cover are planned in the courtyard and on the outside grounds as well." The sentence is ambiguous because "large" could apply only to "trees" or to "trees, shrubs, and ground cover." As the latter is improbable, let us assume that "large" applied only to "trees." How big is a large tree? In California we have redwoods over a hundred feet tall. Is large 100 feet? Twenty-foot trees are large in most landscaping terms, but expensive. In the current taxation climate of California, will they have the money to put in 20-foot trees? Or will they be lucky to have any money for landscaping at all? All these musings on my part could have been eliminated by indicating the height and species of the trees planned. In most cases, words such as "large," "small," "big", "little," "significant" or "insignificant," and "positive" or "negative" can either be replaced by quantitative facts or deleted.

In one case I was suspicious that adequate field work had not been done for an EIS. When I found references to a "recent field inspection," I promptly commented, "When was the 'recent field inspection' conducted?" (Bendix, 1976). In a previous (1975) EIS, "recently enacted legislation" turned out to be California's McAteer Petris Act, which was passed in 1965.

A U.S. Department of Housing and Urban Development (HUD) (1976) EIS stated that bus service to the project area was "adequate." If the author had given the statistics instead of making a value judgment and not bothering to put in the figures, he would have been better off. I happened to know how area residents felt and commented, "Residents have already complained about the lack of service of public transport to the area. The implied assumption that it is adequate needs documentation" (Bendix, 1976). My comments on this document also suggested that the number of days the area experienced concentrations of pollutants in excess of standards be described by something more specific than a "small number of days" and I also asked, "What is a 'normally acceptable' noise level?"

The adverse impacts of bad graphics. How many people know that architects have conventions about shadows that have nothing to do with the physical possibility of shadows being cast by the sun? I did not know this until I started reading EIRs and EISs. In one EIR, in order for the shadows shown and the north arrow both to be correct, San Francisco would have to be in the southern hemisphere. No architect would be bothered by this, I suppose, but it bothers me. I am sure that most readers of the EIR assumed that at some time of day and year, shadows such as those shown would actually occur. The few people who realized that this was impossible probably thought that the stupid bureaucrats had goofed again. Eliminate excess detail. Much of what appears on architects' drawings is meaningless and distracting to someone unfamiliar with such drawings. Similarly, you do not need the detail of navigational maps for land-based coastal projects.

The City and County of San Francisco (1978) EIR for the notorious Dow project in California had lovely color photographs of the region with no indication of the location of the site, the direction from which the view was seen, or the height of the proposed project compared to the relief shown. The graphics were beautiful, but they did not belong in an EIR.

You cannot quantify aesthetics. As concerns about historic buildings and energy-conserving advantages of building reuse compared to demolition and construction increase, there are more and more arguments about the merits of older buildings. Aesthetics is a matter of opinion and a very touchy area for government to set foot in. Government has no business legislating what is beautiful, but planners must have a hand in project design in order to fulfill their role as guardians of a community's character. Controversy over architectural merit extends beyond old buildings to new ones. The architect thinks that he has created a masterpiece that relates sensitively to the site; some members of the public see the design as an abomination. How should such issues be dealt with in an EIR or EIS?

The following examples of the handling of aesthetic issues are taken from the EIRs for two controversial projects proposed for the same portion of San Francisco's Union Square. Each of these passages was the result of debate between proponents, opponents, and city staff, much of it concerning the use of architectural and planning terminology. The project was partially described in a direct quote from the architects:

> After several attempts, it was determined that the (existing) building simply could not function as a new Neiman-Marcus store. We, therefore, proceeded to design a new store which would function properly and preserve the most significant architectural feature of the old building, the rotunda dome. The new design places the rotunda on

> the corner of Geary and Stockton Streets facing Union Square, enclosed in glass making it visible from the Square. (City and County of San Francisco, 1978a)

This was followed by a statement of the City Planning Department Design Guidelines for the site and a discussion of the ways in which the proposed building did and did not comply with the design guidelines. This analysis ultimately led to recommendations for design changes to bring the design into closer compliance with the design guidelines that become conditions for project approval. This type of analysis was also used for the second case, where the appropriate design guideline was stated at the beginning of each paragraph:

> The facade of the upper floors should present a scale and texture similar to the office buildings and hotel facades on the square, rather than most typical contemporary department store facades. The articulation of the facade of the proposed building would be less ornamental than the Renaissance style of the St. Francis, and more detailed in line and contrast than the simplicity of the Qantas Building. The recessed windows on the second and top floors of the proposed building would repeat the recessed window treatment found on the second and top floors of the Qantas Building. The modular structure of the facade of the proposed building's 50-foot wide granite elements separated by the recessed glass elements would give a similar effect to that of modular structure of the St. Francis Hotel's three vertical elements of approximately similar widths separated by dark recesses. (City and County of San Francisco, 1978b)

CONCLUSION

The common thread through all the examples presented in this paper is concern for the question, "Who is the audience?" An EIS must state as neutrally as possible the key facts that the reader needs to develop an informed opinion about a project. I have tried to describe some of the means of achieving this aim.

Time taken to consider the applicability of these points to a particular case can often avert later time expenditures for reorganization, revision, and cutting. A logically organized, well-written EIS can do more to clear the way for approval of a good project than any advocacy document can. The facts speak for themselves: if there is only one reasonable alternative, this will become apparent.

After using all the guidelines above, before you publish a draft EIS, sit down with the document and pretend that you are the most vociferous and feared project opponent - politician, community leader, whoever it may be. What parts of the EIS will that person read first? Read them. What will be the reaction? If you do this regularly, you can learn to spot the unnecessary red flags that cause unnecessary problems. Edit so that what has to be said is said in a way that informs the critical reader and defuses controversy. If you do it right, you will have a socially useful EIS.

REFERENCES

Bendix. S. (1975), Comments on behalf of the City and County of San Francisco on the Bureau of Land Management's (1974) *DEIS Proposed Increase in Acreage to Be Offered for Oil and Gas Leasing on the Outer Continental Shelf.* February 21.

Bendix, S. (1976), Comments on behalf of the City and County of San Francisco on *DEIS, Phases II and III of the Residential Development of the Hunters Point Redevelopment Area In San Francisco, California.* HUD-R09-EIS-76-20, May 2.

Bureau of Land Management, U.S. Department of the Interior (1974), *DEIS Proposed Increase in Acreage to Be Offered to Oil and Gas Leasing on the Outer Continental Shelf.* DES 74-190.

Bureau of Land Management, U.S. Department of the Interior (1980), *FEIS Crossman Peak Radar Proposal.* January

Bureau of Reclamation, U.S. Department of the Interior (1977), *DEIS New Melones 230 kv Electrical Transmission Line, Central Valley Project.* DES

City and County of San Francisco (1978a), *FEIR, Neiman Marcus Department Store,* Vol. 1. EE 77.257, December.

City and County of San Francisco (1978b), *FEIR, Saks Fifth Avenue Union Square Project.* EE 74.285, March 16.

City and County of San Francisco (1979), *Final Environmental Impact Report, Southeast Water Pollution Control Plant.* August.

Department of General Services, California Agriculture and Services Agency (1980), *FEIR for the San Francisco State Building.*

Liebeman, L., and Yost, N. (1980), Legal opinion - referral under 40 C.F.R. Part 1504 of Interstate 84, proposed between Hartford, Connecticut, and Providence, Rhode Island, April 30.

Meister, R. T. (1980), *1980 Farm Chemicals Handbook.* Willoughby, Ohio: Melster.

Robilliard, G. A. (1977), Carrying Capacity of Ecologists in the Environmental Consulting Niche. *Bulletin of the Ecological Society of America,* 58, 4.

Slovic, P., and Fischoff, B. (1979), Preliminary draft of a chapter in the forthcoming book by L. Gould and C. A. Walker (Eds.), *Too Hot to Handle: Social and Policy Issues in the Management of Radioactive Wastes.* New Haven: Yale University Press.

Speth, G. (1980), personal communication to Hon. Neil Goldschmidt, April 30.

U.S. Department of Housing and Urban Development (1976), *DEIS, Phases II and III of the Residential Development of the Hunters Point Redevelopment Area In San Francisco, California.* HUD-R09-EIS-76-20.

Different names for the same document

- Environmental Impact Assessment report (EIA report)
- Environmental Impact Statement (EIS)
- Environmental Assessment report (EA report)
- Environmental Effects Statement (EES)
- Local usage:

Effective Reporting

- assists the proponent to plan
- assists the decision-maker to decide
- helps the public to understand

Main elements of an EA report

- executive summary
- aims of the proposal
- description of proposal and alternatives
- relationship to current land use policies
- description of expected conditions
- evaluation of impacts
- evaluation of alternatives
- impact, monitoring and training plans
- appendices

Producing an executive summary

- keep it short (3 to 10 pages)
- make it clear
- avoid jargon and any terms not defined in the summary and which could be misinterpreted
- consider the needs of local readers as well as those of decision-makers
- include all significant findings
- check for accuracy and consistency

EIA report executive summary

- proposal title, description, location
- name of proponent
- name of organisation preparing the EIA report
- outline of proposal
- major impacts
- recommendations for mitigation/ compensation
- proposed monitoring

EIA report — description of the proposal

- status of project
- planning, design and implementation strategies
- requirements for materials, water, energy, equipment
- planned processes and products
- visual aids (maps etc)
- options (eg. siting, layout)
- summary of technical, economic and environmental features

Evaluating impacts for each alternative

- assessment of impact
- data and predictive methods used
- uncertainty and gaps in knowledge
- compliance with standards (guidelines)
- criteria used to assess significance
- proposed impact avoidance or mitigation

Impact management monitoring and training plans

- describe proposed mitigation
- contain schedule for implementation
- assign responsibility for implementation
- detail a monitoring program
- detail proposed reporting and review procedures
- detail proposed training

Appendix materials

- technical information
- glossary
- acronyms
- summary of public involvement program
- sources of data and references
- details of study team
- Terms of Reference

Some common shortcomings of EIA reports

- object of activity described too narrowly
- description does not cover complete activity
- alternatives do not account for the environment
- key problems not described
- sensitive elements in environment overlooked
- standards and legislation are not described or alternatives do not comply with them
- some mitigating measures not considered

Other common shortcomings

- best alternative not described (or insufficiently described)
- serious impacts are not mentioned or not correctly described
- outdated or ineffective prediction models used
- impacts are not compared with standards or targets
- incorrect conclusions drawn

Topic 9—Reviewing

Objectives

To examine the three roles that reviewing plays in the EIA process:

- ❑ reviewing the quality of the EIA report
- ❑ obtaining stakeholder input
- ❑ assessing the acceptability of the proposal

Relevance

- ❑ The consistent and predictable review of EIA reports is important to the decision-maker, the proponent and the public.
- ❑ The quality of EIA reports can be improved when the proponent is aware of the expectations of the body administering the EIA.

Timing

Three hours (not including training activity)

☑ Information checklist

Obtain or develop the following materials, as appropriate:

- ☐ the identity of the agencies/government departments etc with responsibility for EIA review in the local system;
- ☐ any review criteria mentioned in the local legislation or guidelines;
- ☐ a copy of any other locally available review criteria (checklists etc) used to assess the quality of EIA reports;
- ☐ examples of reviews of local EIA reports together with the overall assessments made;
- ☐ an outline of the typical public review process used for EIA reports and how the information received is managed and responded to;
- ☐ copies of public submissions to the reviews of a range of EIA reports;
- ☐ examples of the system of summarizing and reporting on public submissions on the EIA report;
- ☐ copies of any research focused on the quality of EIA reports;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres able to provide assistance in relation to reviewing; and
- ☐ other resources that may be available such as videos, journal articles, list of speakers, and case studies.

Session outline

1

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why they are important.

Reviewing is the step in the EIA process that:

- determines whether the EIA report on a proposed activity is an adequate assessment of the environmental effects, and of sufficient relevance and quality for decision-making;
- collects and collates the range of stakeholder opinion about the acceptability of the proposal and the quality of the EIA process that was used;
- ensures that the EIA report and process complies with the Terms of Reference; and
- determines whether the proposal complies with existing plans, policies and standards.

This topic examines each of the above, focusing in more detail on reviewing the quality of the EIA report. Note that the review process does not decide whether the proposal and its effects are acceptable.[1]

2

Outline a definition of reviewing and introduce the role of the review process in EIA.

The purpose of the review is to provide the information that the decision-makers will require to decide upon the acceptability of the impacts. The review process can also be used to obtain an impartial judgement of the particular, and often conflicting, interests of parties involved and to avoid unnecessary costs and delays. Often a review will identify further information that is required or further mitigation measures that could be included. Review of EIA reports usually commences once the report has been completed. However, it can begin earlier and be used as a monitoring tool to ensure that progress is satisfactory and that the terms of reference are being complied with. It is therefore preferable for the review to be held before the final EIA report is submitted for consideration by the final decision-makers.

Review of EIA reports may be undertaken by government, independent authorities, independent accredited experts or review panels. Members of such review panels should not be stakeholders in the proposal. When there are issues that may require further research, aspects of the proposal that require modification of the EIA report or where the report is inadequate, reviewing may be an iterative process, with the report being returned to the proponent for amendment to remedy inadequacies identified.

Review through stakeholder input can also be undertaken using information gathered in a range of ways. These include information obtained by the public display of the EIA report and the holding of meetings and briefings with affected or interested peoples. The results of this aspect of the review process need to be collated and summarized for the purposes of decision-making. (This part of the EIA process is examined in more detail in Topic 3—*Public Involvement*.)

One important role of those reviewing a proposal is to check that the design complies with relevant standards and policies, or standards of good practice where official standards do not exist. For instance, proposed levels of discharges for a proposal from a multi-national company should not be greater than those allowed in the home country of the multi-national.

Review can also be carried out by proponents during the preparation of the EIA report, as part of a quality assurance process. In this way proponents can ensure that their work is of an appropriate standard before it is subject to external review.

The discussion is now focused on the review of an EIA report. Briefly outline why it is necessary to develop a consistent, systematic approach to the reviewing of EIA reports.

There are benefits to all stakeholders in proposals if a well constructed, consistent and systematic set of criteria is used to review EIA reports. The general standard of EIA reports can be improved when proponents are made aware of government or agency expectations about report standard and coverage. Also, an assessment can be made of the success of the review criteria in achieving governments' aims or in the demands that they place on proponents, and criteria can be revised (strengthened or relaxed) as necessary.

Discuss the factors that need to be considered when reviewing EIA reports. Ask the group if they can identify others.

The process of reviewing involves establishing a set of criteria that are to be met and the minimum standards that are to be achieved for each one. These standards will vary with the relative importance of the particular criterion. In some countries a review report may be written, for consideration by an independent panel.

Reviewing can be carried out to decide whether:

3

- the report has adequately addressed the Terms of Reference;
- there is sufficient information on the objectives of the proposal and its environmental setting, alternatives, impacts, mitigation and monitoring;
- the information is correct and is scientifically and technically sound;
- the EIA process was conducted appropriately, and the points of view of all parties involved have been taken into account;

- the information has been presented so that it can be understood by both the decision-makers and the public;
- the information is relevant to the parties involved in decision-making; and
- there is sufficient information for the implications of the environmental impacts to be assessed by the decision-makers.

Describe the steps involved in reviewing an EIA report. Discuss how these steps correlate with the process used locally.

4

The following steps can be adopted for a best practice approach to reviewing EIA reports[2]:

- set the scale/depth of the review
- select reviewer(s)
- use input from public involvement
- identify review criteria
- carry out the review
- determine the remedial options
- publish the review report

Setting the scale

The questions that should be addressed at the start of each reviewing process are:

- How much time is available for the review?
- Are funds available to carry out the review?

The answers to these questions will depend mainly on the nature of the proposal and will determine the speed and intensity of the review. The choice ranges from a quick overview by one person to an in-depth review by a team of experts assembled to do the job.

Selecting reviewer(s)

The number of people involved in a review can range from one, for a smaller project, through to a team where projects are large and where sufficient time and money are available. The expertise required for the team must be assessed on the basis of the most important environmental issues and aspects that govern the activity. For example, the ideal composition of a team reviewing the EIA of a proposal for a sanitary landfill would include a landfill engineer, a geohydrologist and an ecologist. The team of experts can only operate well if it receives coordinating support to arrange a site visit to the project, meetings, background information and secretarial backup.

Using input from public comment

Practical experience in a number of countries has shown that seeking comment from the public is very important to the quality of the review process. The input from the public proves to be very important in checking and determining the quality of the descriptions in the EIA report including existing quality of the environment, the importance of the effects to be expected from the proposed activity and the acceptability of possible alternatives.

In some countries organizing public comment in the reviewing stage is a responsibility of the review team. In others, the review team takes note of the results of public comment processes that have been organized by the competent authority.

Identifying the review criteria

Once the organizational aspects of the reviewing process have been dealt with, the review criteria have to be selected. This can be done by answering the following set of questions:

- *Are any terms of reference/scoping guidelines available for the review?*
  If scoping guidelines are available for the EIA report, it is clear that these should be included as part of the terms of reference in the review. When no scoping guidelines have been prepared prior to the preparation of the EIA report, the first task of the review is to scope the main aspects of the project to be addressed in the EIA report. This can, for example, be done with the help of general or generic checklists.
- *Are any existing reviews of EIA reports of comparable activities in similar settings available?*
  Existing reviews of EIA reports about comparable activities and settings provide useful reference material about the type of information that is considered significant for the activity and for the decision. These can be from the country concerned or elsewhere. It is useful to learn about problems experienced during the implementation and operation of the projects. These experiences may reveal important clues to the precise nature of impacts occurring during implementation and operation.
- *Which general review criteria should be observed?*
  In addition to the specific guidelines for an EIA as mentioned above, the following factors should form the basis of general review criteria:
  - legal EIA requirements (if any);
  - national and regional environmental target values, standards, guidelines or criteria about emission levels and environmental qualities (eg sulphur dioxide and nitrous oxide levels governing air quality, drinking water standards, etc) directly related to the activity;
  - the state of the development of technological and environmental sciences involved in the EIA report;
  - the quality of the scoping and screening;
  - the quality of impact prediction;
  - the quality of the evaluation of the impact significance;
  - the assessment of alternative options;
  - the quality of the mitigation proposed;
  - the quality of the monitoring proposed;
  - the involvement of the local people in the EIA process;
  - the significance of impacts in view of the decision; and
  - the clarity of statements and the presence of a concise executive summary.

How these criteria are reviewed depends very much on the time available and the expertise in the review team.

In the review, special attention must be given to the quality of the executive summary of the EIA report. In the summary, the significance of the impacts must be explained concisely in a non-technical manner. Decision-makers and most readers of the EIA report usually study only the summary. Hence, if the summary does not reflect the substance of the issues in the EIA report, the EIA report has not communicated an important part of its message to the decision-makers and to the public.

(The range of different review methods is examined in the next section and a set of review criteria is provided in the resource section for this Topic.)

Carrying out the review

The actual execution of the review could progress through three steps:

- Step 1: identify the deficiencies in the EIA report using the scoping guidelines, review criteria and a review of any comparable EIA reports and their reviews.
- Step 2: focus on any crucial shortcomings observed in the EIA report and determine which shortcomings are so crucial that they directly influence the decision. In other words, the review must clearly separate the crucial shortcomings from the less important deficiencies. If no serious omissions are found, the review report must state this clearly. Remarks about less important deficiencies which have no crucial significance to the decision should be deleted from, or where appropriate be moved to an appendix of, the review report.
- Step 3: Recommend to the appropriate authority how, and when, any serious shortcomings should be remedied to assist decision-making and improve its implementation.

Determining remedial options

Three remedial options are available when an EIA report fails to meet the standards required. These are based on the nature and extent of the inadequacies.

- *The shortcomings of the EIA report are so serious that they require immediate remedy in the form of a supplement to the EIA report or a new EIA being undertaken by a different, more competent team.*
  In this situation, the review report must give a clear statement as to how the additional information can be collected and presented. The review team must realise that the decision-making will be delayed by some time until the new report or supplement to the EIA report is completed.
- *The shortcomings can be rectified fairly easily by means of a set of explanations and conditions attached to the decision.*
  This situation has the advantage that the decision-making can proceed as planned without considerable delay in gathering additional environmental data.
- *The shortcomings are not major but cannot be remedied immediately, either by providing additional information to the EIA, or in the form of explanations and*

  conditions attached to the decision, because they require too much time and effort to collect.
  In this case the review may recommend monitoring the shortcomings and uncertainties during the implementation and operation of the activity with possible corrective measures if impacts turn out to be worse than expected.

In some rare cases the proposal or the EIA report can be so unacceptable that the proposal is rejected.

Publishing the review report
If the review concerns only a judgement of the quality and adequacy of the environmental information in the EIA report, the completion of the third step signals the end of the review. In this case, the reviewing report contains either a clear statement that no serious shortcomings are noted, or an overview of these shortcomings, including recommendations on how these could be remedied.

However, in some countries the result of the review process can also include advice on whether or not to proceed with the activity. Then an additional step must be added to the three steps mentioned above:

- Step 4: give either the green or the red light to the activity. It may alternatively give a yellow light indicating a conditional decision.

If this extra step is required, it must be emphasised that the review should follow the three-step approach as outlined above and remain as objective as possible, before addressing the final question of whether to proceed with the proposed activity or not. If this is not done, the review runs the risk of being inclined too early towards a decision in favour of a certain solution without proper assessment of the quality of the information provided.

Outline the different review methods that can be used and discuss any methods that have been used locally. What experience have the group members had of these, or other, review methods?

5

Just as in the impact analysis process itself, there is also a range of methods that can be used to review the adequacy of an EIA report. These methods include: general checklists, project specific checklists or guidelines, ad hoc processes, expert opinion, accredited reviewers, public review, panels of inquiry, independent commissions and legal approaches

6

7

General checklists
These can be developed using compliance with the local legislation or guidelines as the starting point. A range of criteria based on the points outlined in the section above can then be incorporated. Specific sectoral checklists can be developed from this to cover the consideration of impacts, mitigation, monitoring and scientific and technical adequacy (see review checklist supplied at the end of this topic).

1

Project specific checklists and guidelines
These are much more successful if they are based on a general or sectoral checklist and then adapted to suit the requirements of the specific project and its terms of reference.

Ad hoc processes
Ad hoc processes are the most open to controversy and corruption. This approach greatly reduces the ability of government to set appropriate standards for documentation and reduces the opportunities for building local capacity.

Expert opinion, accredited reviewers
A consultant (of known ability) can be engaged to review the adequacy of the report. Reviews can also be carried out by academic or other institutions, NGOs or an accredited reviewer.

Public review
Public opinion can be sought on the adequacy of the report. This opinion can then be given to the decision-maker for consideration in the decision-making process.

Panels of inquiry and independent commissions
This approach requires the availability of independent experts to review the EIA report and make recommendations to the decision-maker. Usually such inquiries can call for more technical analysis to be carried out and can seek public opinion on the proposal. This approach is generally regarded as being very fair and is well received by the stakeholders in the process.

Legal approaches
Some countries allow the adequacy of an EIA report to be challenged in a court of law. While this has beneficial effects in terms of proponent compliance, it can prove to be very expensive. It may also focus the EIA process on specific legal arguments rather than on its true roles of producing environmentally sustainable design and environmental protection.

Introduce and explain the basis of the *Procedures for Evaluating EIA Reports* supplied with this manual.

See introduction to the *Procedures for Evaluating EIA Reports* in the resource materials of this topic.

Include a training activity to reinforce the topic (if desired).

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Boyle, J. and Mubvami, T. (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe*. Department of Natural Resources, Ministry of Environment and Tourism. Zimbabwe
2. Scholten, J. (1995) *Reviewing EISs/EA reports*. EIA Process Strengthening Workshop, Canberra
3. Lee, N. and Colley, R. (1990) *Reviewing the Quality of Environmental Statements*. Occasional Paper Number 24. EIA Centre. University of Manchester

Further reading

Bisset, R. (1996) *EIA: Issues, Trends and Practice*. Environment and Economics Unit UNEP. Nairobi

Ross, W. A. (1987) Evaluating Environmental Impact Statements. *Journal of Environmental Management*. vol 25. p137-147

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Commission of the European Communities, Directorate General for Environment, Nuclear Safety and Civil Protection (1993). *Review Checklist* ERM. London.

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

9–1 Who has local responsibility for reviewing an EIA report? What other groups or individuals could review the document and what would be achieved if they did?

9–2 If the standard review tables are used, what other aspects of the EIA should a review examine?

9–3 As a group, develop a set of criteria which could be used to review an EIA report.

9–4 What role do the Terms of Reference play in the review process?

Speaker themes

9–1 Invite a speaker who has experience in reviewing locally produced EIA reports to outline the review process used and discuss some common failings. Focus some of the group discussion on ways in which both the review process and the quality of EIA reports can be improved.

9–2 Invite a speaker to outline how review processes are managed when an EIA report is produced in compliance with the requirements of multiple agencies.

Group Activity 9-1: Reviewing

Title	**Reviewing an EIA report**
Aim	To develop familiarity with the process of reviewing an EIA report.
Group size	Three or four people
Duration	Whole day (depending upon the review procedures used.)

Resources required

☐ An EIA report for each group.

☐ Copies of local review procedures or those provided with the manual.

Description of activity:

Each group is to apply the review procedures to evaluate the EIA report they have been given:

☐ the review should be accompanied by a brief (three page) summary of the findings;

☐ each group should then prepare a 10 minute briefing for the 'Minister for the Environment' on their findings; and

☐ present these briefings to the whole group for discussion.

Group Activity 9-2: Reviewing

Title	**Reviewing against the Terms of Reference**
Aim	To practise reviewing EIA reports and to explore the adequacy of using Terms of Reference as the basis of review criteria.
Group size	Three or four people
Duration	Whole day (may be less if the background information is not very detailed)

Resources required

☐ A detailed case study including Terms of Reference and EIA report for each group.

☐ Copies of local review criteria, or those provided with this topic.

Description of activity:

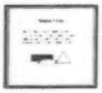
☐ Use the criteria provided to assess whether the EIA report was satisfactory against the ToR.

☐ Discuss whether any weaknesses in the ToR or review process are apparent as a result of the review.

☐ Discuss any further information that could be required before the decision could be made to proceed.

☐ Outline any conditions that should be placed on any approval to proceed.

☐ As a whole group review the findings of the activity.



1

Flowchart of the EIA process

2

Reviewing

The step in the EIA process that determines whether the EIA report is an adequate assessment of the environmental effects and is of sufficient relevance and quality for decision-making.

3

Reviewing considers the adequacy of:

- compliance with the Terms of Reference
- the examination of alternatives, impacts, mitigation and monitoring
- the use of scientific and technical analytical information techniques
- conduct of the EIA process and the consideration of views of all parties
- presentation of information to the public
- presentation of information to decision-makers
- sufficiency of information

4

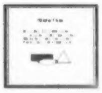
Steps in reviewing an EIA report

- set the scale of the review
- select reviewer(s)
- use public input
- identify review criteria
- carry out the review
- determine remedial options
- publish the review report

5

Range of review methods

- general checklists
- project specific checklists
- ad hoc processes
- expert opinion, accredited reviewers
- public review
- panels of inquiry, independent commissions
- legal approaches



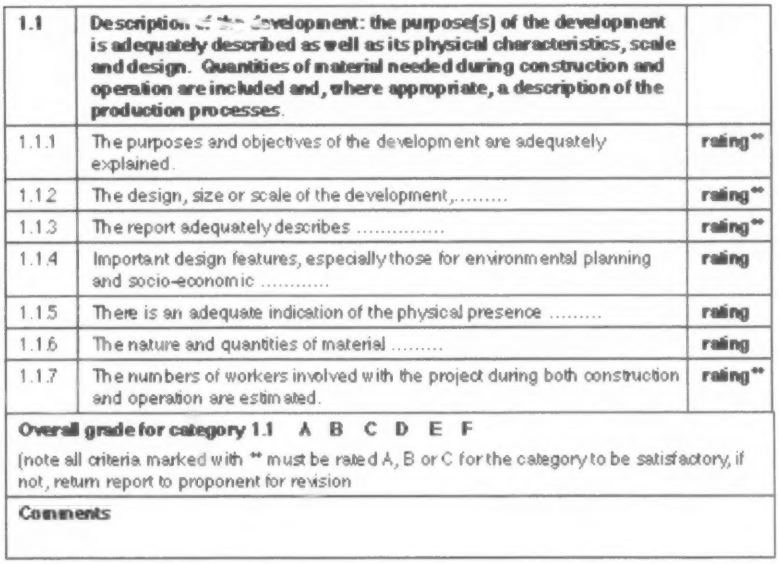
6

Table of review of criteria ratings:

Rating	Explanation
A	generally well performed, no important tasks left incomplete
B	generally satisfactory and complete, only minor omissions and inadequacies
C	just satisfactory despite omissions and/or inadequacies
D	parts well attempted but must, on the whole be considered just unsatisfactory because of omissions and/or inadequacies
E	unsatisfactory, significant omissions or inadequacies
F	very unsatisfactory, important task(s) poorly done or not attempted
N/A	not applicable, the review topic is not applicable in the context of the project

7

Example of table from review method



1.1	**Description of the development: the purpose(s) of the development is adequately described as well as its physical characteristics, scale and design. Quantities of material needed during construction and operation are included and, where appropriate, a description of the production processes.**	
1.1.1	The purposes and objectives of the development are adequately explained.	**rating****
1.1.2	The design, size or scale of the development,.........	**rating****
1.1.3	The report adequately describes	**rating****
1.1.4	Important design features, especially those for environmental planning and socio-economic	**rating**
1.1.5	There is an adequate indication of the physical presence	**rating**
1.1.6	The nature and quantities of material	**rating**
1.1.7	The numbers of workers involved with the project during both construction and operation are estimated.	**rating****
Overall grade for category 1.1 A B C D E F (note all criteria marked with ** must be rated A, B or C for the category to be satisfactory, if not, return report to proponent for revision		
Comments		

Procedures for Reviewing EIA Reports

these procedures are based on the work of

Lee, N. and Colley, R. (1990) Reviewing the Quality of Environmental Statements. Occasional Paper Number 24. EIA Centre. University of Manchester

and

Boyle, J. and Mubvami, T. (1995) Training Manual for Environmental Impact Assessment in Zimbabwe. Department of Natural Resources Ministry of Environment and Tourism, Zimbabwe

Instructions for Reviewing EIA Reports

Background

The following tables provide one approach to reviewing the basic adequacy of the standard of an EIA report. **These tables are not sufficient on their own to fully review a report.** It is recommended that the following should also be carried out:

- a check for compliance with legal or donor requirements
- an assessment of the scientific and technical adequacy of the work
- a public review of the work.

This review should be able to be carried out by a person who is familiar with the environmental impact assessment process and the requirements of any local regulations.

Instructions

The review process is outlined on the flowchart on the following page.

There are four review areas, each with a series of review categories.

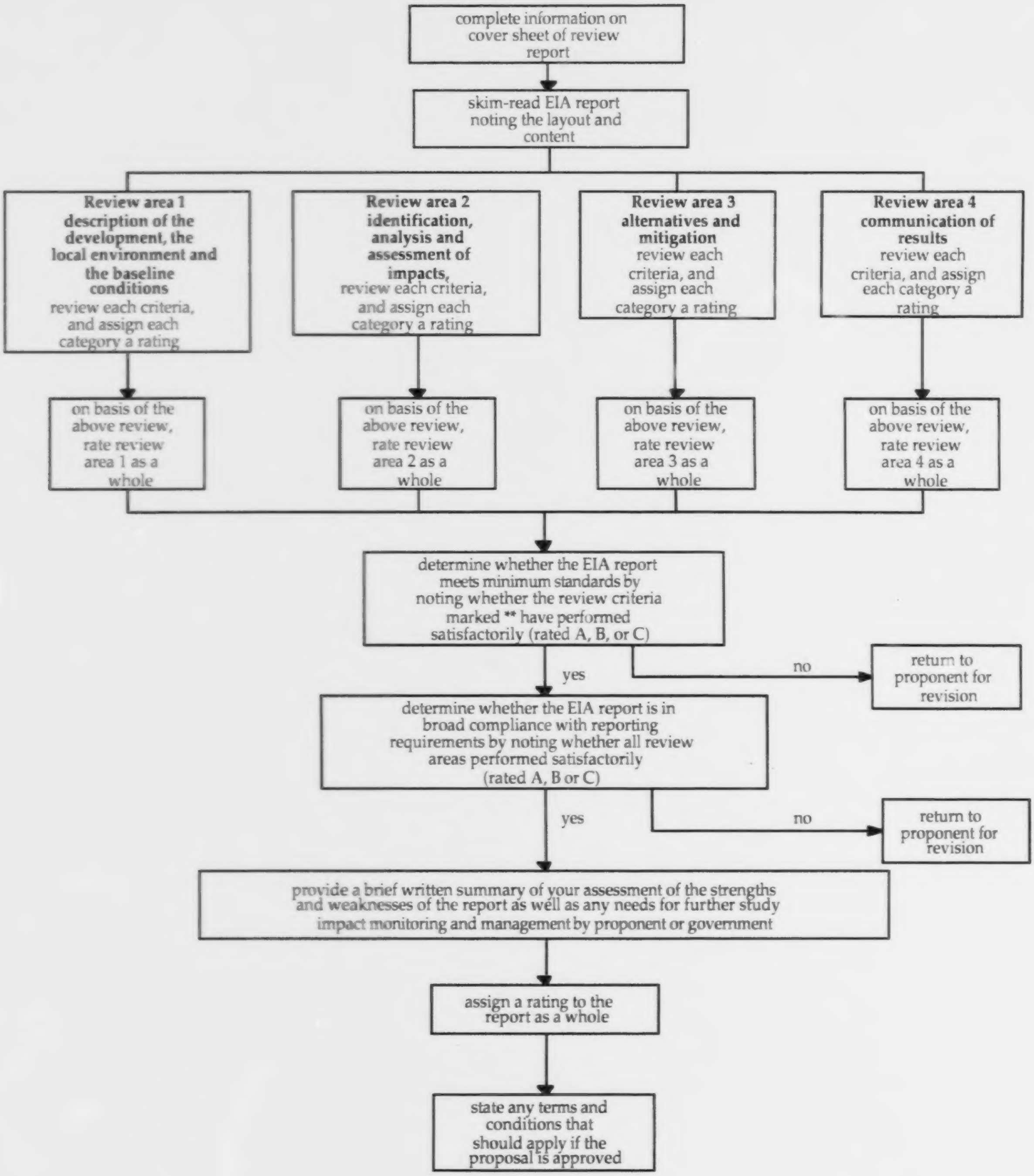
For each review category, the reviewer is asked to rate the EIA report for its performance in addressing a list of issues. The reviewer gives each issue a rating between A and F (see table of review criteria for details). The overall rating for a category is then determined by the reviewer on the basis of the results of the individual ratings, weighted according to their relative importance by the reviewer.

Some issues and categories (marked **) are essential to the overall adequacy of the EIA report. If they do not achieve a minimum rating of C the report should be returned to the proponent for improvement, or other remedial action should be taken as appropriate.

The evaluation of the overall report is determined by the reviewer, based on the ratings of the review categories, again weighted according to their relative importance. Added to this evaluation should be:

- a brief summary of the strengths and weaknesses of the report
- any needs for further study
- any impact monitoring and management required to be undertaken by the proponent or the government.
- any terms and conditions that should apply if approval of the proposal is granted.

Procedures for Reviewing EIA Reports


complete information on cover sheet of review report
skim-read EIA report noting the layout and content
Review area 1 description of the development, the local environment and the baseline conditions review each criteria, and assign each category a rating
Review area 2 identification, analysis and assessment of impacts, review each criteria, and assign each category a rating
Review area 3 alternatives and mitigation review each criteria, and assign each category a rating
Review area 4 communication of results review each criteria, and assign each category a rating
on basis of the above review, rate review area 1 as a whole
on basis of the above review, rate review area 2 as a whole
on basis of the above review, rate review area 3 as a whole
on basis of the above review, rate review area 4 as a whole
determine whether the EIA report meets minimum standards by noting whether the review criteria marked ** have performed satisfactorily (rated A, B, or C)
yes
no
return to proponent for revision
determine whether the EIA report is in broad compliance with reporting requirements by noting whether all review areas performed satisfactorily (rated A, B or C)
yes
no
return to proponent for revision
provide a brief written summary of your assessment of the strengths and weaknesses of the report as well as any needs for further study impact monitoring and management by proponent or government
assign a rating to the report as a whole
state any terms and conditions that should apply if the proposal is approved

Review of EIA Report

EIA report title and date:

EIA report reviewed by:

Dates of review:

Review criteria:

Rating	Explanation
A	generally well performed, no important tasks left incomplete
B	generally satisfactory and complete, only minor omissions and inadequacies
C	just satisfactory despite omissions and/or inadequacies
D	parts well attempted but must, on the whole be considered just unsatisfactory because of omissions and/or inadequacies
E	unsatisfactory, significant omissions or inadequacies
F	very unsatisfactory, important task(s) poorly done or not attempted
N/A	not applicable, the review topic is not applicable in the context of the project

EVALUATING ENVIRONMENTAL IMPACT STATEMENTS

W.A. Ross

Journal of Environmental Management. (1987). Vol 25 pp. 137-147

In this paper, the main roles of Environmental Impact Statements (EIS) are identified; aspects which are necessary features of a satisfactory EIS are discussed; and the roles of EIS evaluators are identified. The EIS is the basis for the public hearings and plays a substantial role in helping the Panel determine its conclusions and recommendations and write its report. The role of the EIS continues, however. For a project which ultimately proceeds, it will be a very important document, along with the Panel report, to help guide environmental management of the project. In deciding whether the EIS is satisfactory, one should consider three aspects which will determine its suitability for the three roles indicated. These are its focus (does it address all of the important issues?), its scientific and technical soundness (does it provide credible and useful results?), and its clarity of presentation (is it succinct, well organized and clear?).

Those asked to provide an evaluation of the EIS are simply asked to provide suitable comment. However, it is possible to categorize the roles generally played by the different evaluators. The technical evaluators (such as government agency representatives selected for their expertise) are likely to address primarily the question of scientific and technical soundness. Some aspects of EIS focus will also be involved directly or indirectly. Public evaluators (individuals or interest groups) will play many different roles depending on the proposal and on the evaluator. Contributions to all three aspects of the EIS can be expected of the public. The Panel secretariat, because of its special relationship with the Panel, should receive close guidance from the Panel and should generally provide evaluation based only on factual matters about the EIS. The secretariat may also make other contributions to the Panel, such as undertaking minor research tasks or providing factual information, in order to help the Panel evaluation basing its decisions both on what it receives from others and on its own reading of the EIS.

It is hoped that, by applying the principles suggested here, evaluations of the EIS will be made consistently, fairly and rigorously.

Keywords: environmental impact statement, evaluation, Canadian, environmental assessment.

1. INTRODUCTION

The purpose of this document is to provide a basis for the evaluation of Environmental Impact Statements (EISs) carried out under the Canadian Federal Environment Assessment Review Process (EARP). It is directed specifically at EARP Panels and Panel secretariats. Not only is a basis for undertaking EIS evaluations provided, but suggestions are made about the roles which the various evaluators should play.

An important reservation about the application of this approach to evaluating EISs must be identified early. Many of the desirable features described in this report apply to ideal EISs. Unfortunately, many real-world EISs are not very close to the ideal. Hopefully, EIS quality will improve and more desirable features will be found in the future. Environmental Assessment Panels will always, however, have to apply their best professional judgement in evaluating EISs submitted to them. It is hoped that the criteria identified in this report will provide a basis for applying that professional judgement more consistently, more fairly and more rigorously.

Filmed as bound

It should also be noted that some EARP public reviews have managed to proceed without a formal EIS. There has also been a diversity of types of review; some are very broad area-wide reviews, while others have focussed on a specific project which had already been given approval. Notwithstanding this diversity, the basic principles espoused in this report are applicable to all reviews. Even when there is no formal EIS, there is always a set of documents submitted which constitute an analogue and to which these evaluation ideas can be applied. Certainly, the details will vary somewhat and that, again, implies a need for good judgement by the Panel.

2. METHOD

In order to develop ideas for this report, the author consulted those with experience in evaluating EISs. Interviews were conducted with FEARO representatives (mainly Panel chairmen and executive secretaries), with former EARP Panel members and with representatives of other government agencies. Those involved in preparing EISs were consulted; interviews were conducted with environmental consultants and with industry representatives. Academics with research interests in the field were also consulted. A full list of those interviewed is available from the author.

Those interviewed were asked the open-ended question "How should one evaluate an EIS?" Depending on the response, further queries were used to obtain detailed replies.

3. THE ROLE OF THE EIS

Under the federal Environmental Assessment and Review Process, a project for which there are potentially significant impacts is referred to the Minister of the Environment for public review by a Panel. An independent Panel is then formed which conducts the public review of the project in accordance with terms of reference established for the referral; environmental and directly related social effects of the proposal are always examined (FEARO, 1979; Government of Canada, 1984). As a general rule, the review will proceed with the Panel developing guidelines for the preparation of an EIS; the proponent (the organization intending to undertake the proposal) prepares the EIS based on these guidelines; and the EIS is submitted and evaluated publicly, followed by a public hearing on the proposed project based on the EIS. The Panel prepares a report containing its conclusions and recommendations. The importance of the EIS is that it "is the basis of the formal review" (FEARO, 1979).

To see how the EIS plays this role, it is necessary to examine more closely how the EIS guidelines are prepared and what they are likely to contain. The Panel normally holds guideline hearings in order to seek the advice of the public and of government agencies on the content of the guidelines. In creating these guidelines, it is important to select the few issues which will affect the decision about the project and to focus the EIS on these issues. These important issues will be determined on the basis of both technical and public advice. In past reviews, while some modest efforts to narrow the EIS guidelines to the important issues have been undertaken, these have not been very successful. As a result, the EIS has dealt with both important and unimportant information; and, hence, so has the public review. Ross et al. (1986) discuss the importance (and means) of focussing the EIS via the guidelines. The expectation here is that such focussing (or scoping) will be done more selectively in future reviews and that issues not deemed to be important by the Panel will be excluded in the EIS guidelines.

The following generic description of the EIS presents an earlier view of its role in EARP, and thus an indication of what might be requested in the EIS guidelines.

> The EIS prepared by, or on behalf of, the initiator of the project is the basis of the formal review. It describes the project, its location, the need for it and any alternative methods of achieving the project other than the one proposed. The EIS also describes the area's existing environment and current patterns of resource use, social factors such as population characteristics, community lifestyle and the economic base of the area. It provides a detailed description of the potential effect of the proposal on the area's environment and identifies the measures the proponent intends to take to reduce those impacts. Any impacts that might remain after these mitigating measures have been taken must also be identified (FEARO, 1979).

However, there has been a continuing evolution in the environmental assessment process so that three adjustments to this description seem in order. First, as noted above, the EIS should be focussed on the matters which will make a difference to the outcome of the review and should not attempt to be encyclopedic. Second, the importance of environmental monitoring and managing of a project (should it proceed) is now recognized as a crucial means of achieving good environmental results (Janes and Ross, 1985). No amount of pre-project assessment will allow all effects of a project to be predicted accurately; thus, it is necessary to put in place both a mechanism to determine the effects (monitoring) and a means of responding to these observations in an environmentally appropriate manner (management). The need for the EIS to address these features is clear and should be reflected in EIS guidelines. Third, in the last few years, several follow-up studies have been undertaken of projects subjected to prior environmental reviews. These studies have observed and documented the effects of the projects and, as a result, a substantially better understanding of project impacts is now available (Banff Centre, 1986). Many environmental assessment researchers have argued that impact prediction abilities would be improved by the use of such studies (Beanlands and Duinker, 1983). There are now enough studies of this kind available that there is no longer any excuse for not using them in the preparation of EISs. Accordingly, one should expect to see guidelines strongly suggesting the use of follow-up studies of earlier related projects, and one should expect EISs to rely on such studies.

Once the EIS has been received from the proponent, it is evaluated by the Panel. The public and government agencies are also involved, as are technical experts hired by FEARO for this purpose. It is the EIS evaluation which is the subject of this report.

The Panel must decide whether the EIS submitted by the proponent contains sufficient information on which to base its review and recommendations. If the EIS is satisfactory, then public hearings are scheduled and the review of the proposed project will continue; if not, then the Panel will request further information from the proponent. In making the decision about whether the EIS will be a suitable basis for the formal public review, the Panel should consider the three important ways in which the EIS will be used. First, it will be the main document addressed at the public hearings. While many other documents will be submitted to the Panel, the EIS will have been seen and reviewed by all participants and will be the main focus of the participants' submissions. Second, after the public hearings, the EIS will play a major role in helping the Panel to prepare the report containing its conclusions and recommendations about the proposal. Third, should the proposed project later proceed, the EIS will again be used in an important way. An environmental management structure of some sort would be introduced to see that the project will be carried out in an environmentally appropriate way, as recommended, for example, by the Panel. Such a structure would make use of the EIS to guide it (for example, regarding mitigation measures to which the proponent was committed). Thus, the EIS should be organized as a basis for this use.

In summary, then, the Panel prepares EIS guidelines which focus the EIS on the important issues. The EIS provides the basis for the public review of the project, is used significantly by the Panel in writing its report, and, with the report, is likely to play a major role in guiding environmental management during project operation.

4. EVALUATION OF THE EIS

There are three distinct aspects to look for in evaluating the EIS. They are indicated by the following questions.

(1) Is the EIS suitably focussed on the key questions which need to be answered to make a decision about the proposed action?

(2) Is the EIS scientifically and technically sound?

(3) Is the EIS clearly and coherently organized and presented so that it can be understood'?

Only if all of these questions have affirmative responses can the EIS play its proper role as the basis of the formal review. These three aspects (focus, scientific and technical soundness, and clarity of presentation) of the EIS will now be addressed in more detail.

4.1. Focus Of The EIS

The EIS must address the important environmental issues. Hopefully, these issues will be those which are outlined clearly in the guidelines. While the EIS must be complete, in that it addresses all the important issues, equally it must not contain a lot of specious material.

Clearly, the most straightforward check to apply is whether the EIS responds fully to the guidelines. Based on the guidelines, a checklist should be created to determine whether each element of the guidelines is addressed in the EIS. The evaluation of the EIS must address not only the questions about predicted impacts and technical mitigation measures, but also the treatment of alternatives and monitoring and management plans. To the extent required in the guidelines, project alternatives should be analyzed fully and clear reasons given as to why the proposed project was selected. Monitoring and management plans should also be addressed in some detail. The EIS should identify the impacts to be monitored, the types of monitoring to be undertaken, the management structure introduced for dealing with the feedback from the monitoring, the options open to this management in dealing with that feedback, the commitment of the proponent to the monitoring and management program outlined, the roles of public members of the affected community in the management program, the identification of other agencies (usually government, especially regulatory agencies) involved and the explicit roles and responsibilities of these agencies (Janes and Ross, 1985).

Clearly, if the EIS fails to address issues which must be understood in order to make a decision about the proposed project, it is inadequate as a basis for the formal review and such deficiencies will have to be remedied. The Panel, however, will need to exercise care in making such a judgement. The lack of full treatment of certain items in the guidelines may be justified. For example, after further investigation, the proponent may have concluded that the impacts anticipated when the guidelines were being developed are no longer as expected; where this conclusion is shared by the relevant stakeholders (those members of government agencies and the public who expressed an interest in that item), and where this agreement is documented in the EIS, the treatment of those matters can be less than might otherwise be the case. The general principle is that, where guideline issues are not fully treated, the reason for this omission should be indicated clearly in the EIS. The Panel can then decide whether the response is suitable.

4.2. Scientific And Technical Soundness Of The EIS

One of the most basic requirements for a scientifically sound report is that the methodologies used must be identified clearly. First, the general methodological approach which guided the overall EIS preparation should be presented in the EIS and the rationale for choosing this approach, given the EIS guidelines, should be provided. In addition, methods designed to approach specific analytical tasks (e.g. population forecasts, census of a selected species, archeological investigations) should be described. Ideally, these methods should be explained in such a way that other persons could duplicate the research. Essentially, the EIS (or its supporting documents) should indicate how the guidelines have been translated into an overall methodological approach and a set of scientific and technical questions which guided the preparation of the EIS.

The use of data and the means of analysing them to reach conclusions are other important scientific issues. The quality of the data and of the analysis procedures used must be such that credible and useful results are obtained. This outcome will generally require use of the scientific and technical literature relevant to the issues addressed, and indications of how the literature has been used should be found in the EIS. In particular, existing follow-up studies of comparable projects should be used to the fullest extent possible. What has happened before in similar or analogous situations can be one of the best guides to what will happen as a result of the proposal.

The data used in the analysis must be of sufficient quality to support the conclusions drawn from them and the conclusions must reflect the data. Where there are gaps in available data, these must be identified. In most cases, the suitability of data and analysis used will need to be assessed by experts familiar with the field, although the final judgement on this matter is the responsibility of the Panel.

The EIS must state explicitly the predicted changes which the proposal will bring about, and it must show the basis upon which these predictions have been made. It is also important to indicate the extent of scientific uncertainty associated with each prediction. This indication leads to the notion of probability and the need to recognize that certain impact predictions are not known with certainty. For example, in dealing with the health effects of hazardous substances, it is necessary to reject the dichotomy of safe or unsafe levels of emissions. Such a dichotomy implies a false certainty; instead, one must recognize that a range of probabilistic outcomes is the rigorous result of the analysis. Use of the techniques of risk assessment should be made in preparing and in presenting an EIS where circumstances warrant. However, where sophisticated risk assessment approaches are not justified, simpler, more common notions of probability will suffice (phases such as "likely", "improbable" or "almost certain").

The EIS should also indicate the significance of each identified impact, i.e. its importance to society. The justification for claims about significance should be stated clearly.

Mitigation or compensation measures proposed in the EIS should be described fully and their rationale provided. The question of whether these measures are technically viable (i.e. whether they will work) should also be addressed. This is where the use of published follow-up studies of other completed projects assessing the same sort of mitigation measures would be helpful.

The dual aspects of environmental monitoring and environmental management must be addressed substantially in the EIS. The objectives of monitoring programs should be stated clearly, as should the scientific basis for the programs. In particular, the question of whether there is adequate pre-project data against which to compare the monitoring results must be addressed. Of course, the monitoring program must provide useful information to the environmental management structure (mentioned above) which will use that information to alter the project accordingly (e.g. increase efforts where new or greater impacts are found; reduce efforts where no impacts or lesser impacts are observed). Consequently, the roles and responsibilities of this management structure must be spelled out. Members to be represented (organizations or individuals) in the structure should be identified in the EIS.

There are a number of other indicators of scientific and technical quality which should be looked for in an EIS. A few of them will be mentioned here. Providing the names and qualifications of those who contributed is desirable, for the following reason:

> Identifying the persons responsible for the work underlying a particular scientific publication serves a primary purpose of permitting the credit or blame to accrue to individuals, thus presumably providing a powerful incentive for quality work and honest reporting. It also allows others to judge the likely quality or significance of a publication on the basis of the authors' reputations, or on the basis of information about credentials or affiliations that is commonly provided along with names (Indiana University, 1982).

While those responsible for the work should be identified, the proponent should be clearly responsible for the EIS in order to demonstrate a commitment to its contents.

Another positive indication of the quality of science in an EIS would be signs that it was prepared by an interdisciplinary team. The benefits of such an approach are indicated in Holling (1978) and in Holling and Chambers (1973). It is also worth noting that, in the United States, the preparation of an EIS requires a "systematic, interdisciplinary approach" (U.S. National Environmental Policy Act. 1969, Section 102). Indicators of an interdisciplinary approach would include references to team meetings in which the various (disciplinary) researchers met or reviewed and commented on drafts of each other's work. The methodology could also reflect such an approach, and some of the issues dealt with are likely to have required the effective integration of more than one discipline.

Implicit in the basis of environmental impact assessment is that consideration should be given not only to the direct impacts of proposed actions but also to their indirect effects and to cumulative impacts of the proposed and other actions. Therefore, the extent to which possible linkages or relationships between the environmental components are considered in the EIS is another indicator of scientific quality and sophistication.

There are many other indicators which may indicate quality (e.g. discussion of time horizons, use of dynamic models, quantifiable threshold criteria). However, there are too many to mention and not all would be applicable to a given proposal.

4.3. Clarity Of Presentation Of The EIS

If the EIS is to play its role as the basis for a public review, it must be well written. It is all too easy to obscure critical issues with poor organisation and writing. It is not sufficient for an EIS to have addressed all of the required matters, using suitable methodology and good data, to make for good impact prediction and assessment. It must also convey these results to those participating in the public review. It must be logical and easy to follow so that it can be understood by experts and interested non-experts alike.

One of the common features of EISs which makes them less than the concise readable documents they should be is information overload. The provision of excessive detail is probably a result of a perceived need to cover all the bases by including everything conceivably relevant; the result is bureaucratic paperwork, the net effect of which is nothing but obfuscation.

Another concern which affects the readability of the EIS is the use of scientific and technical terms (jargon). These terms must be defined, either in a glossary or in the text. Even where technical terms are defined, their excessive use, like excessive use of acronyms or abbreviations, will reduce the clarity of an EIS.

The components of the EIS should also be well integrated so that the various sections are consistent with, as opposed to contradicting, one another. Mitigation measures proposed in one section should be examined to see if they are likely to make impacts identified in another section worse. Such problems can easily arise when different parts of the EIS are prepared by different groups and inadequate attention is paid to aggregation of the results. Clearly, this need for internal consistency is related to the benefits of an interdisciplinary approach in preparing the EIS.

While reference has been made to "the EIS", in reality there are likely to be several documents submitted. Frequently, there will be a short summary, the full EIS, and various other supporting documents. The summary document must be directed at the interested public; the EIS provides more detail; and the supporting documents would be expected to provide the technical back-up to the EIS. While the need to make this material concise and readable applies to any material submitted, the fact that the different materials, in terms of technical detail, are aimed at different audiences should be considered in evaluating them.

The reasons for this need for a clear, logical and easy-to-follow presentation of the EIS are not limited to facilitating information flow to the public. All reviewers will find that parts of the EIS address material in which their technical and scientific expertise is limited. A fisheries expert, for example, may have only a modest understanding of the social and economic effects on people (even fishermen). To accommodate this difficulty, it is important that all parts of the EIS be presented clearly so that all reviewers (both technical experts and laymen) can follow the ideas presented.

The question can be raised as to whether an EIS should be judged to be deficient because of a lack of clarity in presentation. The answer is clearly "yes", but depends very much on the nature of the presentation problems. One of the possible indicators of a poor presentation is that the scientific and technical experts misunderstand what is contained in the EIS and provide a criticism of what was written rather than what was intended. If this is a concern, i.e. if the EIS is written so poorly that it cannot be evaluated properly, it is clearly deficient. In making a judgement about the quality of an EIS, the Panel should consider the three major uses to which it will be put: as the basis for the public review, as an important resource for the Panel in writing its report, and as an indication of the proponent's intent in guiding environmental management of the project during implementation. If it becomes clear to the Panel that the clarity of presentation of the EIS is poor enough to create problems, then some form of remedial action is in order.

5. ROLES OF VARIOUS EVALUATORS

It is the responsibility of the Environmental Assessment Panel to determine the suitability of the EIS. However, in making this decision, advice is sought from other evaluators. These may include the Panel secretariat, representatives of other government agencies (government technical experts), technical experts hired by FEARO and the public.

5.1. Technical Evaluators

As a part of the public review, the other government agencies which have specialist knowledge or responsibilities relevant to the proposal will participate in the review, and, in particular, will evaluate the EIS. These evaluators will deal mainly with all aspects of the scientific and technical soundness of the EIS. The experts will, for their individual areas of expertise, advise on whether the results described in the EIS are credible and useful. The credibility will be based on the data, analysis and methodology adopted; the usefulness will be based on comparing the answers provided in the EIS with the questions posed in the EIS guidelines. Evaluators not familiar with the guidelines may identify a gap in the EIS where certain material consciously excluded from the guidelines had not been mentioned. For this reason, such guidelines should indicate clearly the excluded materials along with the reasons for their exclusion. The guidelines should also be circulated with the EIS material.

The technical evaluators will frequently read only a part of the EIS and supporting materials, generally that part which deals with their areas of expertise. To the extent that this is true, the focus of the EIS (that is whether the EIS responds fully to the guidelines) will not be addressed by this group of evaluators. However, the possible addition of new issues or the deletion of issues, and the scientific or technical justification for doing so, will be considered by technical evaluators.

Clarity of presentation will be partly addressed. Discrepancies between expert interpretations or differences between what evaluators understood and what the proponent intended are important indicators of a failure to communicate effectively. The technical evaluators may also point out ambiguities or inappropriate claims which result from an unclear presentation of the EIS. However, experts in a given field will be much more tolerant of the use of jargon than others simply because of familiarity with the technical terms. Also, internal consistency of the EIS cannot be addressed if only a part of it is read. (This practice of having experts read only a part of the EIS creates a problem for the proponent. In trying to keep the EIS succinct and to the point, repetition is undesirable. However, for impacts which span more than one discipline, such repetition may be necessary to avoid having the unidisciplinary referees provide a negative review when they do not see the full story.)

Technical experts should be hired by FEARO to provide further evaluation when the Panel is convinced of the need for additional expertise. This would occur, for example, when an issue is not being addressed, or where a greater diversity of views is required on a particularly important topic. The role of these technical experts is to provide the necessary evaluation of the EIS and to review the proposal, and they should be appointed as soon as a need for them is identified, and be managed by the executive secretary. Their role will be to provide an evaluation of issues and of material submitted to the panel (in particular of the EIS) and to provide this evaluation to the Panel publicly.

5.2. The Public

The nature of the evaluations submitted by the public varies greatly. Some (e.g. academics) are, effectively, technical experts with a fairly narrow area of interests, and their submissions will be of the type discussed above. Others (e.g. certain interest groups) may make submissions which are less technical, but are more oriented towards their particular concerns. These submissions may well deal with the focus of the EIS; they are particularly likely to deal with the treatment of alternatives (perhaps advocating one) and to allude to omissions or incomplete treatment of matters of importance to the groups making the submissions. Individual members of the public are likely to select one or a few matters of importance to them in their submissions.

Most of these submissions from the public (whether from those with technical expertise, from interest groups, or from individuals) will touch on some matters of scientific and technical soundness, on some matters of focus, and on clarity of presentation. Misunderstandings of content here provide a good indication to the Panel that a lack of EIS clarity may lead to difficulties at the public hearings.

5.3. Panel Secretariat

The Panel must determine beforehand what it expects from the secretariat in terms of an evaluation of the EIS. (For a more detailed discussion of secretariat use by EARP Panels, see Ross, 1986.) In making the decision about what advice to seek from the secretariat, however, the Panel should be aware of the special relationship which it has with the secretariat. All information submitted to the Panel from other sources (proponent, technical evaluators or public) is public information. Any comments received from the secretariat, however, need not be public but can be confidential to the Panel. In the interest of fairness, the Panel should limit the roles of secretariat members to providing factual matters, and, to the extent reasonably practicable, away from the exercise of subjective judgements. (Such a restriction is not imposed on other participants in the review.)

One of the clear roles for the secretariat is to go through the EIS with a checklist to ensure it responds fully to the EIS guidelines. Outside reviewers may not address this aspect completely and, to be certain that it is done, this seems to be an ideal secretariat task.

Evaluation of the scientific and technical soundness of the EIS generally involves value judgments and might be better avoided by the secretariat. This is, in part, a shame as individual members of the secretariat may well be competent to provide such an evaluation. However, in the interest of having a public review which is also seen to be fair, it seems necessary to restrict the secretariat's role in this matter to one of checking clearly factual matters, such as confirming numerical calculations or other simple claims. It would also be reasonable to have secretariat members do minor research tasks at the request of the Panel. These could include obtaining for the Panel documents (such as relevant follow-up studies) or preparing summaries of them.

In terms of dealing with clarity of presentation in the EIS, an experienced secretariat may well be able to provide some advice. This advice would involve anticipating problems (at the public hearings or when the Panel writes its report) due to a lack of clarity in the EIS. Such advice comes close to relying on value judgements, however, and so should be provided with care. Evaluating the internal consistency of the EIS, is much closer to a factual determination and, therefore, is a suitable task for the secretariat.

5.4. The Panel

The Panel has responsibility for making the decision about the quality of the EIS. Technical advisors and the public may provide advice on the scientific and technical quality, but the Panel must make its own judgement based on the advice it receives as well as on its own reading of the EIS. The secretariat and others will offer information on the focus of the EIS, but only the Panel can make the judgement about how fully the guidelines have been addressed. The conclusions about the clarity of presentation can likewise only be reached by the Panel, although information about this aspect will generally come from a variety of sources.

The Panel members will each undertake a full evaluation of the EIS, dealing with all aspects of it (focus, scientific and technical quality, and clarity of presentation). Each member will also consider seriously all submissions made by technical evaluators, the public and the secretariat. These submissions will be discussed thoroughly by the Panel. The validity and importance of all concerns raised will be examined. Some historical comparisons may be useful, for example the treatment of similar concerns by previous panels. Such comparisons can be made by the Panel Chairman or by an experienced member of the secretariat. However, the decision about the quality of the EIS and all the implied value judgements must be made by the Panel considering the role of the EIS in the review.

It is important to distinguish the adequacy of the EIS from the adequacy of the proposal. The former implies only that the EIS constitutes an adequate basis upon which to conduct the review. It is about the latter that the Panel is ultimately charged with making recommendations.

In deciding on the adequacy of the EIS, the Panel should also consider what additional information might be made available by the proponent (especially with some prodding by the Panel) before the public hearings. It may be possible to remedy minor deficiencies in that manner.

REFERENCES

Banff Centre (1986). Proceedings of the Follow-up/Audit of Environmental Results Conference. Banff Centre. To be published.

Beanlands, G.E. and Duinker, P.N. (1983). An Ecological Framework for Environmental Impact Assessment in Canada. Quebec: FEARO.

FEARO (Federal Environmental Assessment Review Office) (1979). Revised Guide to the Federal Environmental Assessment and Review Process, Quebec, FEARO.

Government of Canada (1984). Environmental Assessment and Review Process Guidelines Order, SOR/84-467, Ottawa.

Holling, C.S. (1978). Adaptive Environmental Assessment and Management. New York: Wiley.

Holling, C.S. and Chambers, A.D. (1973). Resource science: the nurture of an infant. Bio Science, January, 1973.

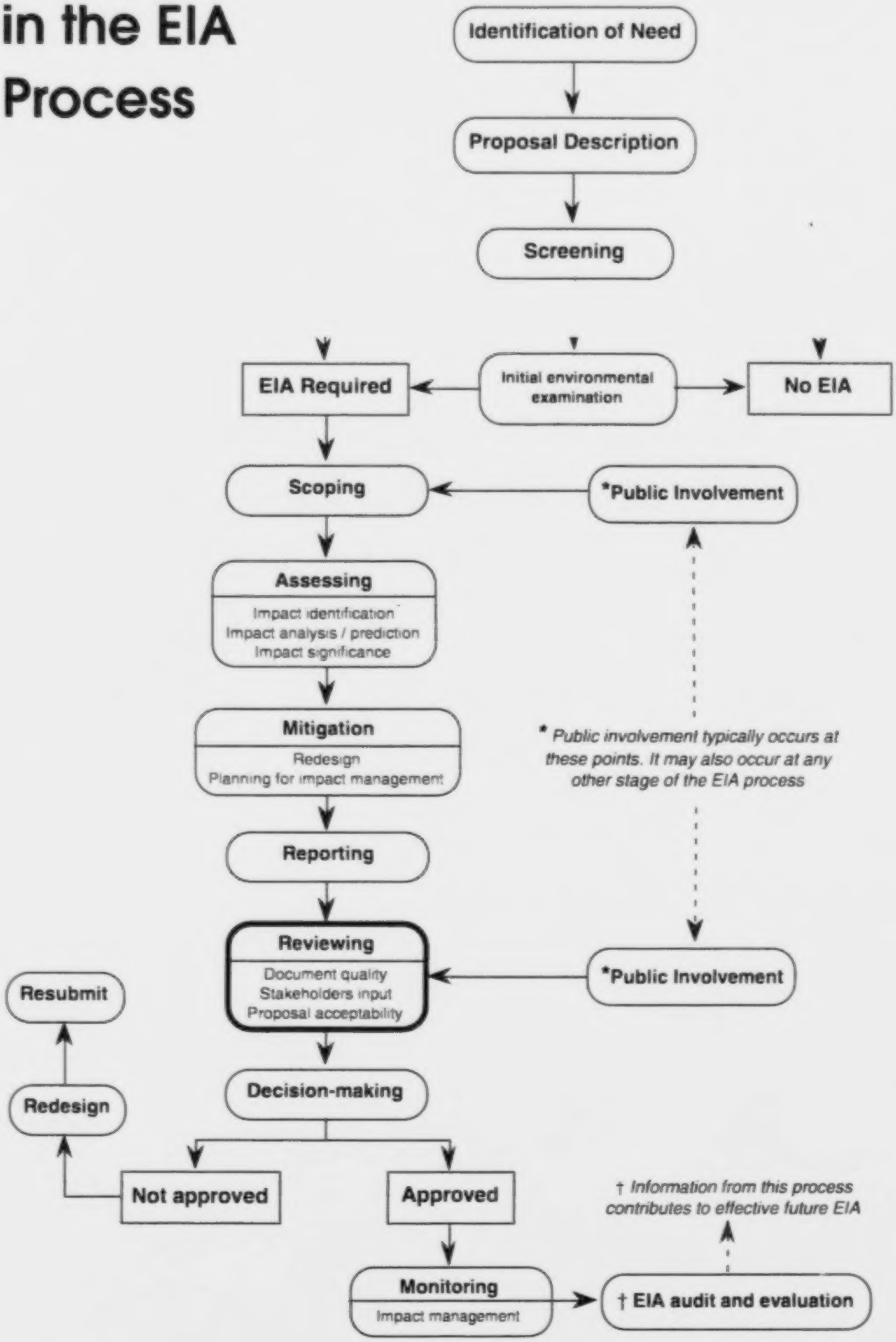
Indiana University (1982). A Study of Ways to Improve the Scientific Content and Methodology of Environmental Impact Analysis. Indiana: School of Public and Environmental Affairs.

Janes, S.H. and Ross, W.A. (1985). Banff Highway Project Follow-up Study, Report prepared for the Environment Protection Service of Environment Canada, Ottawa.

Ross, W.A. (1986). Secretariat Use by EARP Panels, draft, Quebec, FEARO.

Ross, W.A., Sadler, B. and Marshall, D. (1986). On Scoping in EARP, draft, Quebec, FEARO.

Reviewing in the EIA Process



Identification of Need

Proposal Description

Screening

EIA Required

Initial environmental examination

No EIA

Scoping

*Public Involvement

Assessing
Impact identification
Impact analysis / prediction
Impact significance

Mitigation
Redesign
Planning for impact management

** Public involvement typically occurs at these points. It may also occur at any other stage of the EIA process*

Reporting

Reviewing
Document quality
Stakeholders input
Proposal acceptability

*Public Involvement

Resubmit

Redesign

Decision-making

Not approved

Approved

† Information from this process contributes to effective future EIA

Monitoring
Impact management

† EIA audit and evaluation

Reviewing

The step in the EIA process that determines whether the EIA report is an adequate assessment of the environmental effects and is of sufficient relevance and quality for decision-making.

Reviewing considers the adequacy of:

- compliance with the Terms of Reference
- the examination of alternatives, impacts, mitigation and monitoring
- the use of scientific and technical analytical information techniques
- conduct of the EIA process and the consideration of views of all parties
- presentation of information to the public
- presentation of information to decision-makers
- sufficiency of information

Steps in reviewing an EIA report

- set the scale of the review
- select reviewer(s)
- use public input
- identify review criteria
- carry out the review
- determine remedial options
- publish the review report

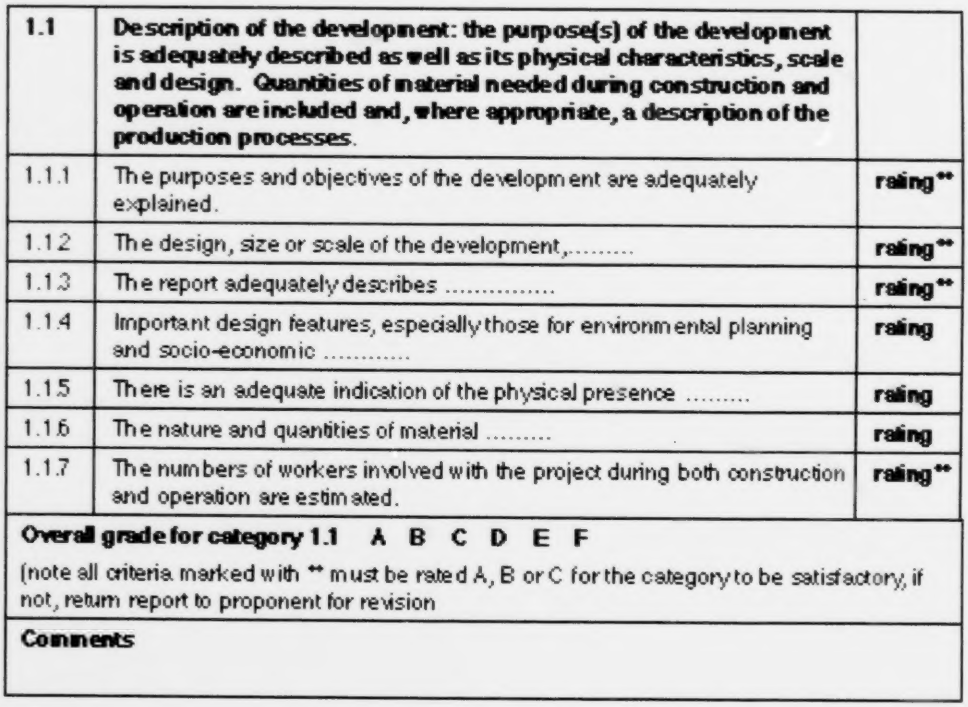
Range of review methods

- general checklists
- project specific checklists
- ad hoc processes
- expert opinion, accredited reviewers
- public review
- panels of inquiry, independent commissions
- legal approaches

Table of review criteria ratings

Rating	Explanation
A	generally well performed, no important tasks left incomplete
B	generally satisfactory and complete, only minor omissions and inadequacies
C	just satisfactory despite omissions and/or inadequacies
D	parts well attempted but must, on the whole be considered just unsatisfactory because of omissions and/or inadequacies
E	unsatisfactory, significant omissions or inadequacies
F	very unsatisfactory, important task(s) poorly done or not attempted
N/A	not applicable, the review topic is not applicable in the context of the project

Example of table from review method



1.1	**Description of the development: the purpose(s) of the development is adequately described as well as its physical characteristics, scale and design. Quantities of material needed during construction and operation are included and, where appropriate, a description of the production processes.**	
1.1.1	The purposes and objectives of the development are adequately explained.	**rating****
1.1.2	The design, size or scale of the development,.........	**rating****
1.1.3	The report adequately describes	**rating****
1.1.4	Important design features, especially those for environmental planning and socio-economic	**rating**
1.1.5	There is an adequate indication of the physical presence	**rating**
1.1.6	The nature and quantities of material	**rating**
1.1.7	The numbers of workers involved with the project during both construction and operation are estimated.	**rating****

Overall grade for category 1.1 A B C D E F

(note all criteria marked with ** must be rated A, B or C for the category to be satisfactory, if not, return report to proponent for revision

Comments

Topic 10—Decision-making

Objectives

To look at the role of decision-makers and the range of decision-making techniques and processes in EIA. This is focused upon the final decision regarding approval of the proposal.

Relevance

In general, EIA processes have been introduced with the express intention that environmental considerations should be incorporated into the design of proposals and the decisions made about them. Those involved in EIA require an understanding of the types of decisions that need to be made about a proposal and that the making of a decision is a value-laden process often constrained by expectations, political culture or existing higher-level policy decisions.

Timing

Two hours (not including training activity)

☑ Information checklist

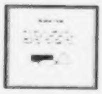
Obtain or develop the following, as appropriate:

- ☐ an outline of the formal steps in the local decision-making process;
- ☐ an example of any quantitative decision-making techniques that have been used locally;
- ☐ examples of any checks and balances in the EIA system that lead to accountability in decision-making;
- ☐ a local EIA report that demonstrates the provision of a range of information vital to decision-making;
- ☐ copies of any research focused on local decision-making;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres able to provide assistance in relation to decision-making; and
- ☐ other resources that may be available such as videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives and why they are important.

This topic looks at the role of decision-makers and the range of decision-making techniques and processes in EIA. This is focused particularly upon the final decision regarding approval of the proposal.



1

2

Introduce the concept of decision-making and the importance of its role in the EIA process. Emphasise the distinction between the role of those carrying out the impact assessment and that of the decision-maker who uses the impact assessment as input to the decision-making process.

EIA is a process of review, negotiation and incremental decision-making. It culminates in an essentially political choice about whether or not the proposal is to proceed, and under what conditions. When the term 'decision-making' is used in EIA it is usually taken to mean the final approval or authorization of a proposal. In certain cases EIA review bodies have decision-making power; that is, their rulings are binding unless explicitly overturned by executive convention.

Because the policy and legislative basis for EIA differs from country to country, there are usually a number of smaller decisions made at each stage throughout the process. Each of these decisions may be made by a different person or group of people. For instance, some decisions, such as with screening and scoping, are made jointly by the proponent, the responsible Minister and the environmental authorities. Other decisions, such as the selection of a viable alternative, may be made by the proponent. As noted, the final approval of a proposal is usually political, typically one in which a broader range of trade-offs are made. Sustainable development requires striking a balance among ecological, equity and economic considerations.

Outline the roles and responsibilities of the decision-maker in the EIA process.

Decision-makers can no longer disregard the influence the environment has on people, business and quality of life. In a world of competing interests, diminishing resources and growing public involvement, a decision-maker needs to take advantage of EIA so that a common focus may be brought to bear on divergent agendas. Astute decision-makers can use EIA to create opportunity where none may have existed and still meet the corporate, governmental or public needs of their respective organizations.

It is important for decision-makers to be aware of the responsibility they have in ensuring that the EIA process is of benefit to a proposal. At a minimum a decision-maker needs to understand:

- the basic concepts and aims of EIA;
- how EIA is used around the world and in comparable organizations;
- 3 EIA requirements as prescribed by corporate, national or international guidelines, policies, legislation or conventions;
- how EIA is being implemented within the organization responsible for the decision on the proposal and the implications of EIA procedures for this decision-making; and
- the political, legal and management implications of public review or challenge associated with an EIA.

With the new mandates of sustainable development and environmental stewardship, decision-makers need to have the knowledge and tools to allow them to:

- broaden their perspectives of the environment and establish new values;
- acknowledge and implement new mandates and responsibilities;
- 4 use new forms of information;
- find more effective ways of sharing and communicating this information;
- re-examine traditional ways of relating environmental concerns to proposals;
- define new ways of measuring progress, status, change and profit;
- become familiar with new ways of managing and accounting;
- adopt more consultative and participatory planning and decision-making processes;
- devise more effective means of influencing individuals and organizations to behave in more sustainable ways; and
- learn about comprehensive, technical approaches to planning, evaluation, assessment, data management and problem solving.

Using a local proposal (real or fictitious) as the basis for discussion, ask the participants to identify the different types of smaller decisions that need to be made throughout the EIA process and specify who might be responsible for making them.

The discussion should include all decisions relating to screening, assessment of the significance of impacts during scoping, the choice of assessment methods and analytical techniques, assessment of the significance of the results of impact analysis, choice of public involvement process, final approval etc. Use the exercise to explore some of the general issues in decision-making, including:

- the circumstances under which decision-making is most successful;
- the relative importance of the series of little decisions as opposed to the final decision; and

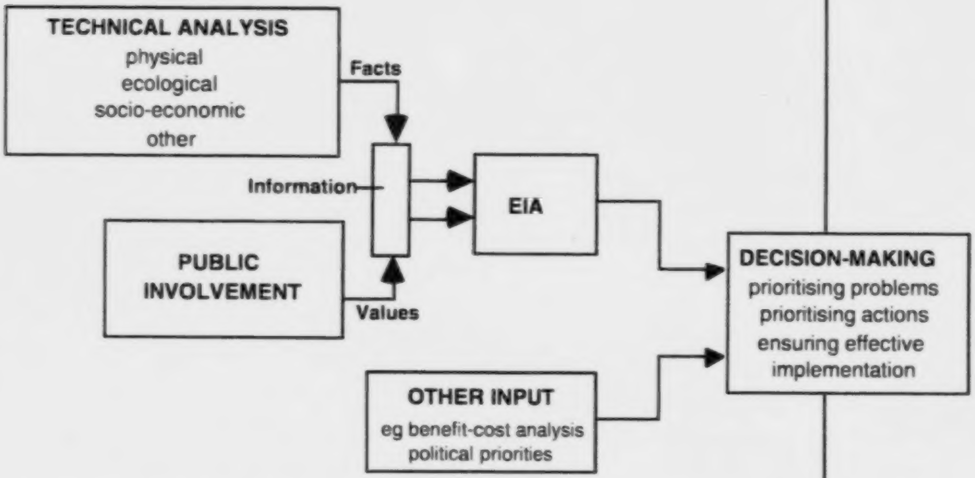
- the importance of being able to impose enforceable conditions as part of the final decision-making.

Now focus the discussion on the role of the person who makes the decision about final approval of the proposal. Outline the nature of the decision-making process emphasising that the EIA may be only one of the factors taken into consideration.

5

Those who make the final decision about project approval are expected to use the information provided by environmental impact assessment, along with information obtained from other sources, to inform them of the environmental consequences of their decision-making. Wood notes that:

> the making of any decision will involve a large number of trade-offs in the information base: between simplification and the complexity of reality; between the urgency of the decision and the need for further information; between facts and values; between forecasts and evaluation; and between certainty and uncertainty. The people making the decision on a proposal involving EIA will frequently be elected central, state or local government politicians. They will seldom have time to read the EIA report and other EIA documentation and will therefore be dependent upon their officials for some sort of summary evaluation of the earlier stages of the EIA process.[1]


TECHNICAL ANALYSIS
physical
ecological
socio-economic
other
Facts
Information
EIA
PUBLIC INVOLVEMENT
Values
DECISION-MAKING
prioritising problems
prioritising actions
ensuring effective implementation
OTHER INPUT
eg benefit-cost analysis
political priorities

Inputs to decision-making

The above figure shows that EIA is rarely the sole basis for decision-making, but that it should have a major influence. The decisions that are made may, or may not, be those that cause the least environmental damage. An important question, on which opinion varies, is whether EIA should be neutral or value free or make the case for the best practical environmental option as well as minimising environmental damage — essentially providing 'contestable advice' based on disparate analysis. The predominant view is:

> ...The role of the assessor is to estimate impacts, and then to report them in a form that makes them readily understandable to citizens and decision-makers. It is not the responsibility of the assessor to convince the decision-maker to cast his vote in favor of the environment. However, he is responsible for bringing environmental issues to the attention of decision-makers. (Folk, 1982)

---

6 **Outline the types of information in an EIA report that could be required by a decision-maker in order to make a final decision.[2] Use a local case study or EIA report to demonstrate how the types of information listed in the table could be best presented.**

The table *Information Considered Important For Decision-Makers* is summarized from an OECD/DAC Terms of Reference Framework provided in Topic 5 —*Scoping*. The handout lists basic requirements for reports which will help stakeholders and decision-makers to understand the proposal at its various stages.

10–1

Information Considered Important For Decision-Makers

Background

- background to the project and the most important environmental issues involved;

Policy context

- the basic development issue or problem being addressed (eg pollution, flooding, drought, erosion, energy shortage, poor health, depressed economy etc);
- the relationship to environmental protection goals, policies and plans.

Alternatives

- alternatives to the proposal (including the best practicable environmental option (BPEO) or equivalent designation);

Public involvement

- key public views
- concerns of affected communities
- areas of agreement and disagreement

Impact analysis

- costs and benefits;
- distribution of gains and losses

Mitigation and monitoring

Conclusion and recommendations

- key findings, including the main economic benefits, significant environmental effects and proposed mitigation measures (use non-technical terms).
- the extent to which the proposal conforms to the principles of sustainable development;
- the design and operational changes that are considered critical in improving the environmental acceptability of the project.

Adapted from OECD/DAC *(1994)*

Discuss whether or not the decision-maker is obliged to consider the outcomes of EIA under local requirements and summarize the requirements in other systems. Outline the range of possible outcomes arising from decision-making.

The extent to which the decision-maker has to use or consider the findings and recommendations of an EIA varies from one jurisdiction to another. Usually there is a requirement for the decision-maker to take the findings into consideration during the decision-making process. Depending upon the legislation, the decision-maker may:

- have complete discretion to make a decision without providing justification;
- be able to make a decision that does not incorporate all of the recommendations of the EIA process but has to publicly explain the reasons why this has been done; or
- have to act fully in accordance with the EIA recommendations.

There can be a number of different outcomes from decision-making. These include:

7

- the proposal can be approved;
- the proposal can be approved with conditions;
- the proposal can be approved subject to on-going investigations;
- further investigations of particular issues can be requested before the EIA report is reconsidered;
- a supplementary document or new EIA report can be requested if there are any significant problems with the original investigation or EIA report; and
- in a very small number of cases the proposal, as formulated, may be rejected.

Discuss the role of quantitative decision-making methods in final decision-making. Use an example of a quantitative decision-making technique available locally to explore the types of value judgements that are inherent in its development.

Decision-making is always a value laden process. Even when formal quantitative decision-making methods have been developed they have been based on the weighting, ranking and combination of variables to some mathematical decision rule – all processes that involve a large number of value judgements. As discussed in Topic 6 —*Assessing*, a number of the impact identification methods (such as the Battelle) incorporate a formal quantitative decision-making function aimed at systematically comparing options. Other techniques, such as multi-criteria analysis (also called multi-objective or multiple criteria decision analysis), have also been developed to help decision-makers clarify the information base and the trade-offs at stake. The more sophisticated of these techniques are able to analyse a mixture of quantitative and qualitative information without the need to assign monetary values to all quantities.

When using decision-making tools such as these, it is important that the values underlying the methods be explored to assess whether or not they are appropriate to the particular situation.

8

9

Discuss the checks and balances that can be built into the system to ensure accountability and transparency in the process. Briefly outline some of the different ways in which the decision, and the reasons for the decision, can be made available to the public. Consider how these might work with reference to the local system of decision-making.

A number of checks and balances are built into EIA processes which help ensure accountability and transparency. At the most fundamental level, this means that the approvals for the proposal are made by a body other than the proponent, and that reasons for the decision and any conditions attached to it are made public. In some jurisdictions this goes as far as including an explanation of how the EIA report and review influenced the decision.

There may also be provision for public right of appeal against the decision. This can increase public confidence in the process, although it may raise costs and add to delays.

Box 1: Checks and balances

The following criteria for decision-making, adopted by major western EIA systems, suggest a number of effective checks and balances:

- the findings of the EIA report and review are a central determinant of the decision on the action;
- the decision can be postponed until the EIA report has been prepared and reviewed;
- permission can be refused, conditions imposed, or modifications demanded at the decision stage;
- the decision is made by a body other than the proponent;
- a summary evaluation is prepared prior to the decision being made public;
- the decision, the reasons for it, and the conditions attached are published;
- these reasons include an explanation of how the EIA report and review influenced the decision;
- public guidance on the factors to be considered in the decision exists;
- consultation and participation is required in decision-making;
- there is a right of appeal against decisions; and
- decision-making functions effectively and efficiently.

Adapted from Wood (1995)

Some jurisdictions require a written public record of the decision. For instance, the US Record of Decision must contain:

- a statement explaining the decision;
- an explanation of alternatives considered and those which are environmentally preferable;
- the social, economic and environmental factors considered by the agency in making its decision;
- an explanation of the mitigation measures adopted and, if practicable mitigation methods were not adopted, an explanation of why not; and
- a summary of the monitoring and enforcement programme which must be adopted to ensure that any mitigation measures are implemented (*Regulations, Section 1505.2*).

This record is on some occasions published in the *Federal Register*.

Briefly discuss approving a proposal subject to compliance with a set of conditions. Emphasise the importance of developing methods of ensuring that conditions will be acted upon. Relate these to the level of confidence or degree of uncertainty associated with key findings of EIA.

10

Most approvals made as a result of EIAs will require modifications to the original proposal and impose conditions and performance standards. Any conditions imposed should take into account the forecasts made in the EIA, but should realistically reflect any uncertainty in these forecasts. Decision-makers need to be told of any doubt about the reliability of data used in the EIA, any gaps in this information, and any limitations placed on the assessment because of these deficiencies.

Other topics in the manual (see Topic 7—*Mitigation* and Topic 11—*Monitoring*) consider a variety of techniques for ensuring that the imposed conditions are met. These include:

- placing performance conditions into legally binding contracts of the builder;
- making the approval conditional upon the production of a suitable impact management plan;
- using quality assurance and environmental management systems to ISO standards; and
- independent compliance monitoring to identify breaches of conditions and the provision of penalties for non-compliance.

Include a training activity to reinforce the topic (if desired)

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Wood, C. M. (1995) *Environmental Impact Assessment: A Comparative Review*, Longman Higher Education. Harlow
2. OECD/DAC (1994) *Towards Coherence in Environmental Assessment: Results of the Project on Coherence of Environmental Assessment for International Bilateral Aid.* Canada

Folk, M. (1982) *A Review of Environmental Impact Assessment Methodologies in the United States.* Institut fur Orts — Regional and Landesplanung. Zurich

Further reading

Bisset, R. (1996) *EIA: Issues, Trends and Practice.* The Environment and Economics Unit UNEP. Nairobi

Hollick, M. (1981) The Role of Quantitative Decision-making Methods in Environmental Impact Assessment. *Journal of Environmental Management*

Lawrence, D. P. (1993) Quantitative versus Qualitative: A False Dichotomy? *Environmental Impact Assessment Review.* vol 13 pp. 3-11

Resource Assessment Commission (1992) *Multi Criteria Analysis as a Resource Assessment Tool.* Research Paper No.6. pp 1-11

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

10–1 Should the decision to proceed, or not proceed, with a proposal be a political decision or not?

10–2 What is the most appropriate method of presenting information to the decision-maker?

10–3 How much emphasis should be placed on the outcome of quantitative decision-making processes in EIA?

10–4 What types of value judgements are inherent in the decision-making process. What techniques can be used by those involved in the EIA to help ensure that environmental impacts of a proposal are weighted fairly in the decision-making process?

10–5 What techniques could be used to help ensure that conditions imposed upon the approval of a proposal are complied with?

Speaker themes

10–1 Invite a decision-maker with experience in proposals that have been subject to EIA to discuss his/her experience in the decision-making process. How have decisions been made? What types of information have been useful/not useful to the decision-making process? What problems have been faced in making decisions and how were these resolved?

Group Activity 10-1: Decision-making

Title	**Practising decision-making**
Aim	To develop an understanding of the decision-making process and the problems that decision-makers face.
Group size	Pairs for the first part, then whole group.
Duration	Half-day

Resources required

- An EIA report.
- A review of the EIA report and recommendations to the decision-maker.
- Case study materials providing background to the proposal including any controversy surrounding the proposal, letters objecting to the proposal etc.

Description of activity:

Taking the resource materials:

- each pair is to review the information and then develop a logical basis for making a decision on the proposal;
- the decision is to be made and a one-page press release justifying the decision is to be written.
- Ask the whole group to represent a party (or parties) dissatisfied with the decision that has been made. In turn, each pair is to justify their decision to this audience and answer questions for about ten minutes.

1

overhead of flowchart

2

EIA is an on-going process of review, negotiation and incremental decision-making, culminating in the essentially political action of making a final decision about whether or not the proposal is to proceed and under what conditions.

3

Decision-makers need an understanding of:

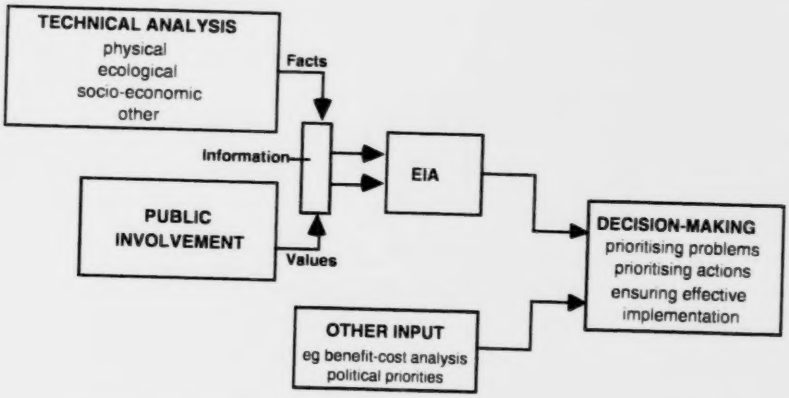
- EIA aims and concepts
- common EIA implementation
- EIA guidelines, policy, law, conventions
- EIA implementation within the decision-making organization
- public review or challenge.

4

Decision-makers need to:

- broaden their perspectives
- acknowledge and implement mandates and responsibilities
- use new forms of information
- share and communicate information
- relate environmental concerns to the proposal
- measure progress
- find new ways of managing and accounting
- adopt consultatative and participatory decision-making
- influence others to behave sustainably
- learn comprehensive approaches to planning and management

5


TECHNICAL ANALYSIS
physical
ecological
socio-economic
other
Facts
Information
EIA
PUBLIC INVOLVEMENT
Values
DECISION-MAKING
prioritising problems
prioritising actions
ensuring effective implementation
OTHER INPUT
eg benefit-cost analysis
political priorities

6 **Information for decision-makers should include:**

- background
- context
- alternatives
- public involvement
- impact analysis
- mitigation and monitoring
- conclusions and recommendations

7 **Possible decisions as a result of EIA:**

- approval
- approval with conditions
- approval subject to ongoing investigation
- further investigation prior to consideration
- request for a supplementary, or new, EIA report
- rejection

8 **Checks and balances:**

- decision is determined by EIA report and review
- no decision until EIA report received and reviewed
- permission can be refused
- conditions can be imposed
- modifications can be demanded
- the proponent is not the decision-maker

9 **Checks and balances (continued):**

- a summary evaluation is made available to public
- decision reasons and conditions are made public
- there has been public consultation
- there is a right of appeal against the decision

10 **Implementing the decision:**

- placing performance conditions into legal contracts
- making approval conditional upon the production of impact management plans
- using quality assurance and environmental management systems to ISO standards
- independently monitoring compliance with conditions

Information Considered Important For Decision-Makers

Background

- background to the project and the most important environmental issues involved;

Policy context

- the basic development issue or problem being addressed (eg pollution, flooding, drought, erosion, energy shortage, poor health, depressed economy etc);
- the relationship to environmental protection goals, policies and plans.

Alternatives

- alternatives to the proposal (including the best practicable environmental option (BPEO) or equivalent designation);

Public involvement

- key public views
- concerns of affected communities
- areas of agreement and disagreement

Impact analysis

- costs and benefits;
- distribution of gains and losses

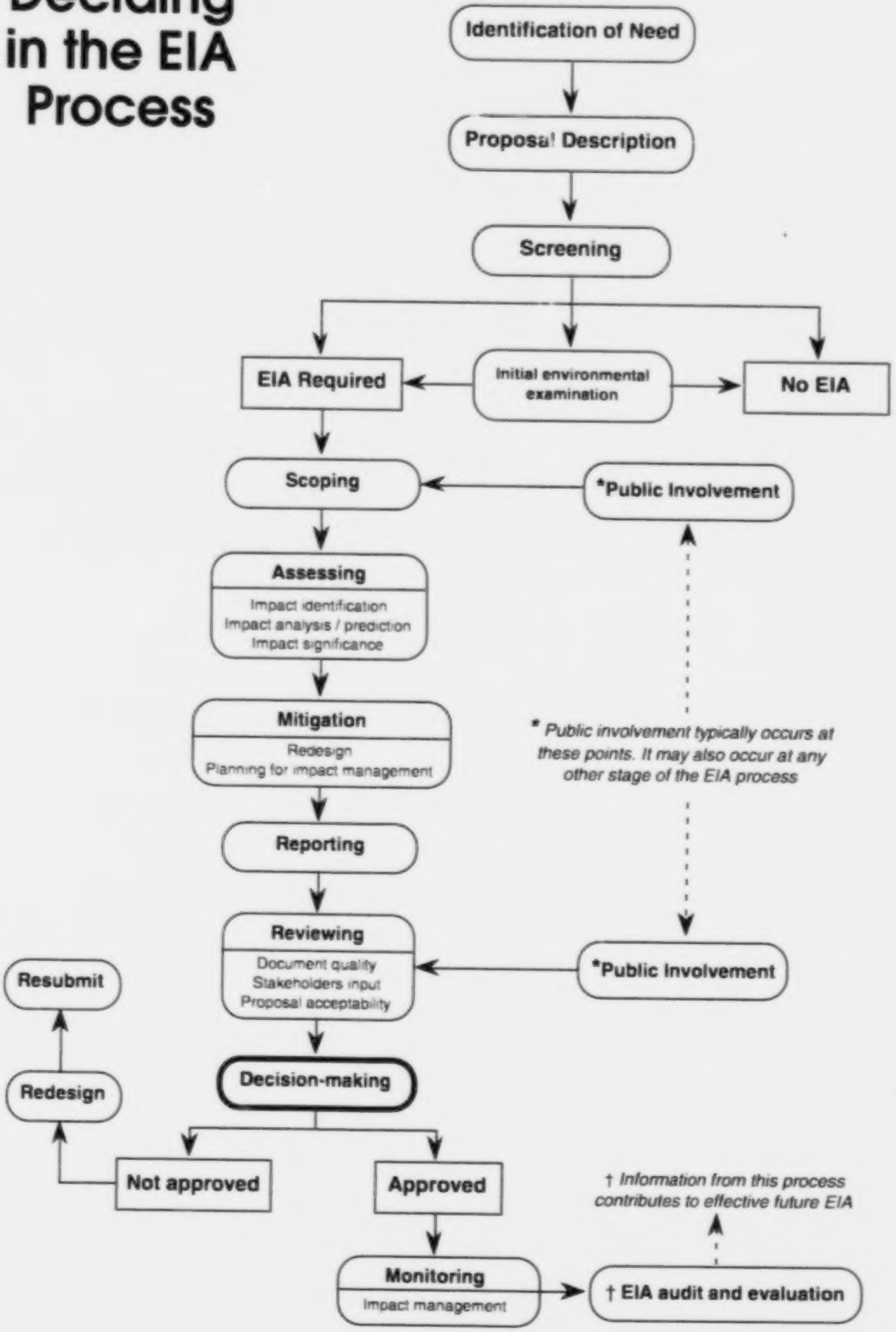
Mitigation and monitoring

Conclusion and recommendations

- key findings, including the main economic benefits, significant environmental effects and proposed mitigation measures (use non-technical terms).
- the extent to which the proposal conforms to the principles of sustainable development;
- the design and operational changes that are considered critical in improving the environmental acceptability of the project.

Adapted from OECD/DAC (1994)

Deciding in the EIA Process



Identification of Need

Proposal Description

Screening

EIA Required

Initial environmental examination

No EIA

Scoping

*Public Involvement

Assessing
- Impact identification
- Impact analysis / prediction
- Impact significance

Mitigation
- Redesign
- Planning for impact management

Reporting

Reviewing
- Document quality
- Stakeholders input
- Proposal acceptability

*Public Involvement

Decision-making

Not approved

Redesign

Resubmit

Approved

Monitoring
- Impact management

† EIA audit and evaluation

** Public involvement typically occurs at these points. It may also occur at any other stage of the EIA process*

† Information from this process contributes to effective future EIA

EIA is an on-going process of review

EIA is an on-going process of review, negotiation and incremental decision-making, culminating in the essentially political action of making a final decision about whether or not the proposal is to proceed and under what conditions.

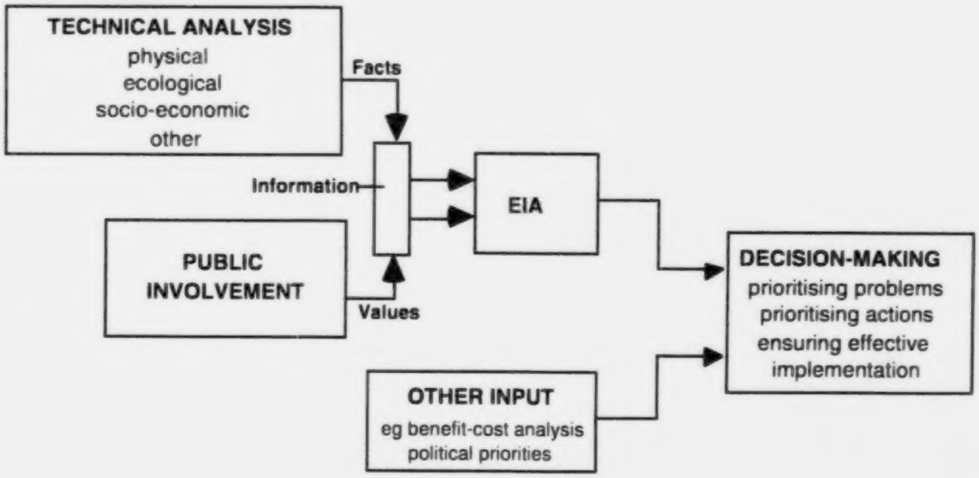
Decision-makers need an understanding of:

- EIA aims and concepts
- common EIA implementation
- EIA guidelines, policy, law, conventions
- EIA implementation within the decision-making organisation
- public review or challenge

Decision-makers need to:

- broaden their perspectives
- acknowledge and implement mandates and responsibilities
- use new forms of information
- share and communicate information
- relate environmental concerns to the proposal
- measure progress
- find new ways of managing and accounting
- adopt consultatative and participatory decision-making
- influence others to behave sustainably
- learn comprehensive approaches to planning and management

Inputs to decision-making



TECHNICAL ANALYSIS
physical
ecological
socio-economic
other

Facts

Information

PUBLIC INVOLVEMENT

Values

EIA

DECISION-MAKING
prioritising problems
prioritising actions
ensuring effective implementation

OTHER INPUT
eg benefit-cost analysis
political priorities

Information for decision-makers should include:

- background
- context
- alternatives
- public involvement
- impact analysis
- mitigation and monitoring
- conclusions and recommendations

Possible decisions as a result of EIA:

- approval
- approval with conditions
- approval subject to ongoing investigation
- further investigation prior to consideration
- request for a supplementary, or new, EIA report
- rejection

Checks and balances

- decision is determined by EIA report and review
- no decision until EIA report received and reviewed
- permission can be refused
- conditions can be imposed
- modifications can be demanded
- the proponent is not the decision-maker

Checks and balances (continued)

- a summary evaluation is made available to public
- decision reasons and conditions are made public
- there has been public consultation
- there is a right of appeal against the decision

Implementing the decision:

- placing performance conditions into legal contracts
- making approval conditional upon the production of impact management plans
- using quality assurance and environmental management systems to ISO standards
- independently monitoring compliance with conditions

Topic 11—Monitoring, Implementing and Auditing

Objective

To explain the role of monitoring and auditing within the EIA process.

Relevance

Monitoring and auditing are used to see what impacts occur; to ensure that the anticipated impacts are maintained within the levels predicted; and to ensure that conditions of approval are adhered to, mitigation measures are effectively applied and the benefits expected from the EIA are achieved as the project proceeds. They can be used to provide information for periodic review and alteration of environmental management plans, optimising environmental protection through good practice at all stages of the project.

Monitoring and auditing can also provide feedback on how the EIA process is working.

Timing

3 hours (not including training activity)

☑ Information checklist

Obtain or develop the following materials, as appropriate:

- ☐ local requirements for monitoring and auditing of proposals;
- ☐ local examples of data collection for environmental monitoring;
- ☐ local case studies that show the use of monitoring and impact management plans, and if possible some costings for these;
- ☐ copies of any research focused on the monitoring and auditing of proposals that have undergone EIA;
- ☐ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres who may be able to provide assistance in relation to monitoring and auditing; and
- ☐ other resources that may be available such as videos, journal articles, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why they are important.

Monitoring and auditing are used to see what actually occurs and to ensure that the anticipated impacts are maintained within the levels predicted, unanticipated impacts are managed or mitigated before they become a problem and the benefits expected from the EIA are achieved as the project proceeds. They can be used to provide information for periodic review and alteration of impact management plans, optimising environmental protection through good practice at all stages of the project.

Outline the need for systematic followup processes for EIA.

A systematic EIA followup process is needed because:

- often relatively little attention is paid to actual effects arising from project construction and operation;
- without systematic follow up to decision-making, EIA may become a proforma process, a paper chase to secure a development permit, rather than a meaningful exercise in environmental management to bring about real environmental benefits and achieve environmental sustainability; and
- increasing numbers of people, funds and time are being devoted to EIA and there is a need to safeguard the returns in terms of environmental benefits and the quality of decision-making.[1]

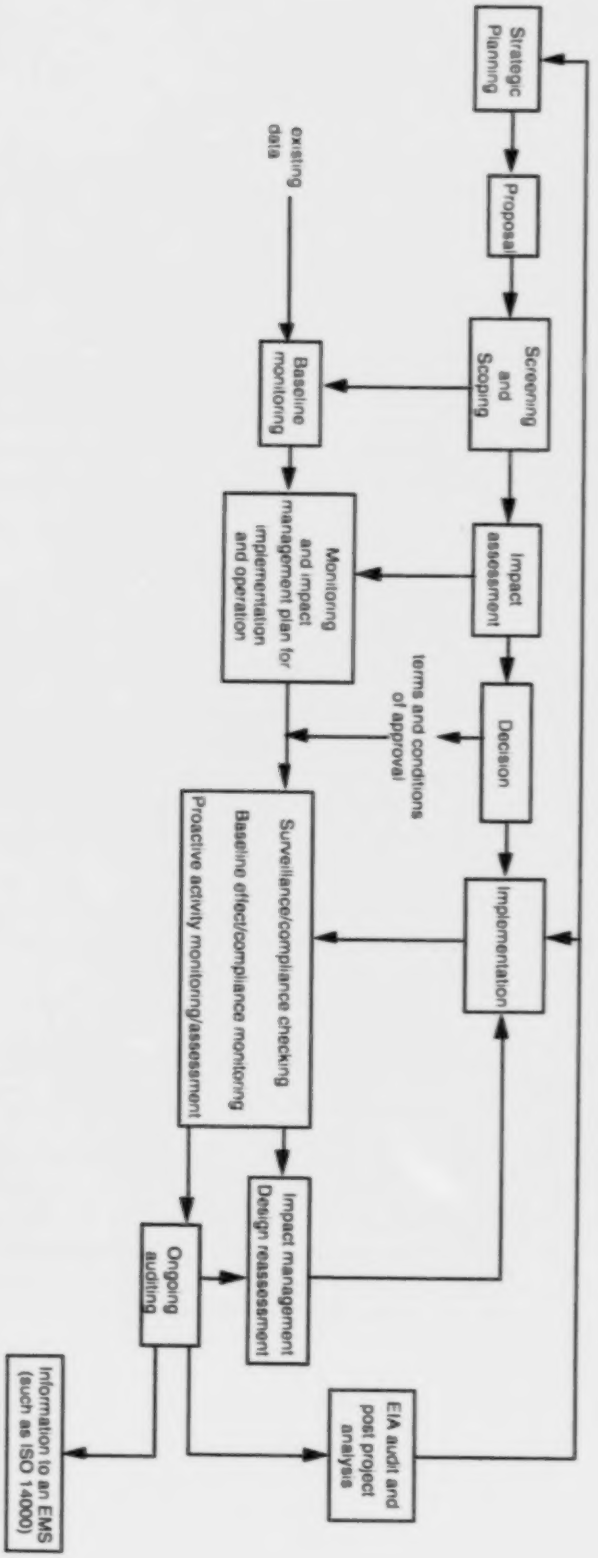
Examine the role of EIA as one of the tools of environmental planning and management.

The sophistication of environmental planning and management tools has grown rapidly in recent years. Under the overarching umbrella of sustainable development exists a range of planning, management, analysis and review tools that can be used individually or in combination to achieve improved information, environmental performance or decision-making. In the box below some of these tools have been grouped according to their primary purpose.

1

The Role and Position of Monitoring and Management in EIA

Adapted from Sadler (1988)


Strategic Planning
Proposal
Screening and Scoping
existing data
Baseline monitoring
Impact assessment
Monitoring and impact management plan for implementation and operation
Decision
terms and conditions of approval
Implementation
Surveillance/compliance checking
Baseline effect/compliance monitoring
Proactive activity monitoring/assessment
Impact management
Design reassessment
Ongoing auditing
EIA audit and post project analysis
Information to an EMS (such as ISO 14000)

2

Box 1: Environment monitoring and performance assessment

Purpose	Examples of Available Tools
systematic approaches to business or organizational management	environmental management systems ISO 14000 series and BS 7750, quality assurance ISO 9000 series
assessing and designing environmentally sound projects and products	environmental impact assessment, risk assessment, life-cycle analysis, technology assessment, total environmental cost assessment
predictive analysis of individual impacts	specific and often highly technical techniques such as modelling of predicted noise levels or changed hydrological conditions
monitoring progress	testing specific parameters to a predefined plan and for a predefined purpose eg. suspended solids, BOD etc for water quality
audit, evaluation and review	often a 'one off' picture of the current environmental conditions used to indicate past or current status eg. compliance audits, EIA audits, contaminated site audit, State of the Environment Reporting

These tools, and their names, are in a constant state of change and development. Some of them are still not mature instruments and are in the process of refinement. Others, even though they may be more mature, may not be used often because of difficulty in assembling and evaluating the large data sets needed for decision-making. Similarly, the use of terminology is constantly changing and is not universal—different names often being applied by different users. For example, *life-cycle assessment* and *life-cycle analysis* have often been used interchangeably although there is now a move towards using *life-cycle analysis* as it is felt to embody fewer assumptions about the exhaustiveness of the evaluation.[2]

The relationship of the above tools with EIA can vary depending on the purpose, application and scope of the individual tool. In many cases they may be used to carry out some of the component assessments in the overall project, for example risk, sources and impacts of pollution, resource consumption and so on. In other situations an EIA might be a small part of a larger system of environmental planning and management.

In recent years EIA has become increasingly oriented towards ensuring effective environmental management during the implementation of a proposal. The development of impact management and monitoring programmes as part of the EIA process has opened the door for proponents and their contractors to use business systems approaches (such as quality and environmental management systems) to ensure that all parties are aware of their responsibilities and that appropriate systems are instituted to ensure that they are carried out. Information from EIA monitoring and auditing can also be fed into other programmes such as State of the Environment Reports.

Box 2: Terminologies Relating to EIA Follow Up

11–1

Post decision analysis

Post decision analysis is a generic term for a wide-range for activities that can occur after a decision is made. It refers to environmental studies (ie. data collection and evaluation) undertaken during and following the implementation phases of an activity.

Environmental monitoring

Environmental monitoring refers to the systematic collection of environmental data through a series of repetitive measurements. A number of different monitoring activities are identified below:-

- *Baseline monitoring* refers to the measurement of environmental parameters during a pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of change;
- *Effects monitoring* involves the measurement of environmental parameters during project construction and implementation so as to detect changes in these parameters which can be attributed to the project; and
- *Compliance monitoring* unlike the previous monitoring activities, takes the form of periodic sampling and/or continuous measurement of environmental parameters, levels of waste discharge or process emissions to ensure that regulatory requirements are observed and standards met. (Surveillance and inspection may also form a part of this activity but need not necessarily involve measurement of a repetitive activity).

Environmental audit

Audit is the term, taken from financial accounting, to infer the notion of verification of practice and certification of data. In terms of environmental management, the objectives of audit include:-

- the organization and interpretation of the environmental monitoring data to establish a record of change associated with the implementation of a project or the operation of an organization;
- the process of verification that all or selected parameters measured by an environmental monitoring programme are in compliance with regulatory requirements, internal policies and standards, and established environmental quality performance limits;
- the comparison of project impact predictions with actual impacts for the purpose of assessing the accuracy of predictions;
- the assessment of the effectiveness of the environmental management systems, practices and procedures; and
- the determination of the degree and scope of any necessary remedial or control measures in case of non-compliance or in the event that the organization's environmental objectives are not achieved.

Audit documents normally required are a *compliance audit*, prepared during the implementation and operation of a project; and a *post-project audit*, prepared after implementation and commissioning of a project, or a systems audit.

Post project analysis

This is a general term used to refer to research and supporting activities which take place after a project has been built.

Taken from Au (1995) *EIA Follow up and Monitoring*

Define monitoring and ask the participants to suggest the range of purposes for monitoring in EIA.

3 EIA monitoring is the planned, systematic collection of environmental data to meet specific objectives and environmental needs[3]. Monitoring can be used to ensure that the benefits anticipated as a result of the EIA are effectively achieved as the project proceeds.[4]

Monitoring involves the planning of a monitoring programme, the collection and analysis of samples and the interpretation and reporting of data. Data compiled from monitoring can be used to:

4
- document the baseline conditions at the start of the EIA;
- assess performance and monitor compliance with agreed conditions specified in construction permits and operating licences and modify activities or mitigation measures if there are unpredicted harmful effects on the environment;
- review predicted environmental impacts for the effective management of risks and uncertainties;
- identify trends in impacts;
- periodically review and alter impact management plans or activities;
- verify the accuracy of past predictions of impacts and the effectiveness of mitigation measures, in order to transfer this experience to future activities of the same type; and
- review the effectiveness of the environmental management.

Responsibility for the following points needs to be agreed before the project is given any approval to proceed:

5
- undertaking and paying for monitoring;
- the management of the information gained from monitoring; and
- implementation of any action that might be required as a result of the monitoring.

Stress the importance of viewing monitoring as a vital and cost-effective part of the EIA process. Emphasise the need for careful consideration of objectives and the necessity to see that the plan sensibly reflects the resources available.

Monitoring is expensive. It needs to be aimed at the level required to successfully manage the project or review the adequacy of the EIA without wasting money by unnecessarily monitoring impacts. Monitoring should be focused on the impacts that are either significant or not well understood (requiring further analysis). It is not necessarily required for all impacts. The collection of information needs to be optimised so that enough is collected to be useful, but not so much that it is wasted.

The design of a monitoring programme needs to reflect the local capacity to implement or to obtain assistance to implement. This means that considerable thought should be given to the objectives of a monitoring programme before the programme is designed. In particular, thought should be given to how the results will be used in practice and for how long the monitoring needs to be carried out.

The monitoring programme should also include action or emergency plans so that appropriate action can be taken in the event of adverse monitoring results or trends.

Monitoring should be linked to impact prediction so that there is information on:

6

- the nature of the impact
- the magnitude of the impact
- the geographical extent of the impact
- the timescale of the impact
- the probability of the impact occurring
- the significance of the impact, and
- the confidence in the prediction of the impact[5]

Monitoring programmes need to be constantly reviewed to make sure that they are effective, and to identify the time at which they can be stopped.

Outline the steps that can be taken to establish an appropriate and cost-effective monitoring programme. Provide participants with general information about how data can be collected and analysed. Emphasise the need to be aware of seasonal variations and draw attention to the role of independent checks.

The aim of the monitoring is to detect trends and changes so that remedial measures may be taken to achieve good environmental performance. Best practice monitoring for a site is determined by the physical and social factors involved. The environmental issues usually cover the environmental values to be protected, potential hazards, potential impacts, level of acceptable change, level of risk and the impact sites. Specific monitoring is often required for biophysical, socioeconomic, health and other factors.

Effective data collection and management

Within each discipline there are appropriate techniques for collecting, analysing and interpreting data. There must be quality control in measurement and analysis, and proper interpretation of the data, preferably by a multi-disciplinary team, to bring a broad understanding and a range of views to the project. Data collection needs to be cost-effective and care needs to be taken to ensure that there are compatible levels of accuracy and precision between related data sets. Reporting needs to make sense to management, the public and other stakeholders in the EIA process. Reporting may also need to be carried out to a specific format to meet the needs of a formal environmental management system.

The box below shows the desired features of a monitoring programme required to ensure effective information management.

7

Box 3: Effective monitoring programmes have:

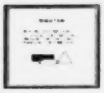
- a realistic sampling programme (temporal and spatial)
- sampling methods relevant to source (point source, aerial, 3d)
- collection of quality data
- compatibility of new data with other relevant data
- cost-effective data collection
- quality control in measurement and analysis
- innovations (eg in tracing contaminants and automated stations)
- appropriate databases
- multi-disciplinary data interpretation to provide useful information
- reporting for internal management and external checks
- allowance for, and response to, input from third parties
- presentation in the public arena (external assessment)

Monitoring information once gathered is analysed by assembling monitoring data in the form of maps, photographic records, data tables and graphs. Maps of the scale 1:5000 are normally sufficient for data presentation and a scale of 1:10 000 is adequate for catchment maps and general site maps. There is an increasing use of computers to analyse and present data and to check for ongoing compliance.

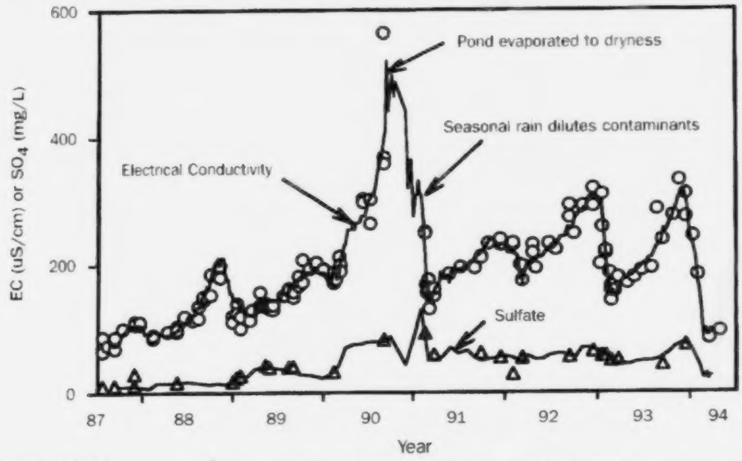
Monitoring programmes should provide time series data which can be analysed from time series graphs. This can be done by:

- visual qualitative assessment of the graphs;
- testing statistical significance of variations;
- determining rates and directions of change; and
- noting the approach to, or exceeding of, critical levels (eg water quality guideline levels).

There are some relational changes, such as in chemical constituents in water, which can be helpful when presented graphically. Longitudinal studies based on numerical data or photographic or descriptive records also provide information on progress and trends. The following figure is an example of monitoring data which shows seasonal variation, an extreme event (drought) and a regulator's independent checks on a company's data.



8



Proponent long-term monitoring showing seasonal variations

EPA, (1995) Δ, O regulator's independent checks of SO_4 and EC respectively

---

Using a local example or the handout 11-2 provided at the end of this topic, discuss the stages of developing an environmental monitoring programme.

9

The following steps in designing a monitoring programme reflect these features of effective monitoring and are appropriate for a number of development proposals:

- identify the scope of the monitoring and the aspects such as social dislocation, water quality, disease vectors etc that require monitoring;
- define the objectives for the monitoring of each of these aspects;
- decide how the information collected will be used in decision-making;
- define the boundaries and select maps and plans, and sites for observation, measurement and sampling;
- select the key indicators for direct measurement or observation;
- define how the data will be analysed and how the analysis will be presented;
- make decisions on the level of accuracy required in the data;
- consider how new data can be used to enhance existing data and make sure that it is in a format that will enable it to be used in conjunction with existing data;
- establish a system for recording and responding to data (anecdotal or otherwise) provided by the community; and
- set minimum requirements for monitoring of air, water quality, social change etc.

Those establishing monitoring programmes should not underestimate the value of simple observation and reporting, particularly by locally affected parties.

11-2

GOAL	Demonstrate to governments and the community that the operation complies with environmental quality objectives determined through the EIA process and achieves good environmental performance
Specific Objectives	• detect short and long-term trends • recognise environmental changes and analyse causes • measure impacts and compare with predicted impacts • improve the monitoring system • improve practices and procedures for environmental assessment

MONITORING

MONITORING REQUIREMENTS

Specific monitoring requirements are developed in the process of preparing an Environmental Management Plan. They include:

- what to measure
- where to measure
- when to measure
- how to measure
- evaluation methods to be used
- additional information required

↔

ENVIRONMENTAL ISSUES

The following issues, identified during the EIA process, should be specified:

- environmental values to be protected
- potential hazards
- potential impacts
- level of acceptable change
- level of risk
- pathways and impact sites

PERFORMANCE ASSESSMENT

From the monitoring program:	From the assessment:
• identify trends, causes and impacts	• modify practices and procedures for environmental protection
• assess performance and compliance	• modify monitoring program

Discuss implementation of the monitoring programme. If there is a local case study available use this to explore the costs of monitoring.

Where no detailed local costings are available, use the materials in Handout 11–3 to discuss possible costs of procedures.

11–3

Procedures, standards and guidelines need to be developed for implementation throughout the life of the project. There also needs to be clear performance criteria against which performance can be measured. At this stage some thought should be given to building the environmental requirements into the construction contracts to aid compliance. It is particularly helpful if the proponent and/or the contractors have quality assurance or environmental management systems in place.

The monitoring recommendations from the EIA need to be costed and scheduled and the responsibility for implementation allocated. The costs of monitoring vary greatly, depending on location and sensitivities associated with the processes involved. They have to be accounted for in the overall costing of the proposal. However, they can generally be offset against the benefits which monitoring brings. There are always immediate cost savings in identifying and rectifying unacceptable environmental impacts at an early stage in the project.

Longer term gains include decreasing future costs for decommissioning and improving the credibility of the proponent when proposing future projects.

Introduce the concept of overall assessment of environmental performance.

Because the monitoring programme usually reflects the objectives of an impact management plan, data compiled can contribute to a systematic and comprehensive report on environmental performance. An annual cycle of reporting and review is often necessary to meet external regulatory requirements and to identify the need (if any) for further intensive studies or for remedial action.

In some countries there is now added emphasis on internal review based on monitoring, investigation, research and development. In larger companies this is undertaken by in-house staff and the use of government resources to supervise environmental performance can be minimised. In these situations the regulatory organization depends on:

- published impact/environmental management plans;
- public company reports;
- some check monitoring; and
- periodic audits.

Companies can also be required to state whether or not they have complied with licence conditions and managers can be made personally responsible for confirming that any standards required by regulation have been met.

Box 4: Monitoring: Ethiopia

An essential component of the Calub Gas Development Project mitigation plan is establishment of an Environmental Monitoring System for the project impact zone, comprising:

- a natural resources component to monitor bio-physical impact, including vegetation composition, devegetation, water, livestock, roadside erosion; and
- a socio-economic component to monitor impact on humans, including population, grain and other local goods, health and education, traffic, fuel , and local attitudes toward the project.

A special monitoring unit has been established for overall coordination.

Define the role of environmental auditing in the EIA cycle of assessing and managing environmental performance.

Environmental auditing is a review process similar to that carried out in financial auditing and can be done on a regular or irregular basis. It usually takes the form of an independent 'one off' examination and assessment of past performance such as for the audit of a contaminated site. One special type of environmental auditing is the EIA audit which can provide an evaluation of compliance with the conditions of approval along with an assessment of the effectiveness of a particular EIA at predicting impact type and characteristics. A formal EIA audit can therefore only be commenced after partial or complete project implementation. Feedback from this type of audit can be used to improve the effectiveness and efficiency of other EIAs in the future.

10

Environmental impact assessment auditing is a management tool that:

- determines the actual impacts and outcomes of projects or decisions that have been subjected to an EIA;
- assesses whether the conditions established by statutory bodies for mitigating the environmental impacts of developments have been implemented and enforced, and whether they ensured that the environment was protected;
- identifies the nature and accuracy of impact predictions, and evaluates the role of impact prediction in the management of environmental impacts of developments;
- evaluates the effectiveness of the EIA process in order to identify areas that could usefully be revised or refocused; and
- examines the effectiveness of an individual EIA in an attempt to identify ways of improving the utility and efficiency of future assessments.

An EIA audit is planned to be specific to the site, although they can offer information which is general to the EIA process as a whole. They can include the completion of checklists and questionnaires, as well as following written guidelines and using rating systems. The table of contents of an Impact Management Plan can be used as a checklist for an audit.

Auditing can also result in:

- an improved image for the product as environmentally sound;
- reduction in public opposition to operations; and
- avoidance of penalties which could result from non-compliance with stricter environmental controls.

Explain that a good EIA audit can only be achieved if a well designed monitoring plan is in place and producing the necessary data.

EIA audits are not always straightforward. Quite often impact predictions have not been made in an auditable manner and the design of the project may have changed between the EIA and the construction. There may be a need to collect information some time before trends can be identified, particularly large scale, smaller probability impacts (such as oil spills) which are not very frequent, or effects of long term impacts (such as exposure to heavy metals) which may not become apparent for some years.

Feeding back to the monitoring programme

Findings of the audit and other less formal reviews need to be fed back into the monitoring plan and into management systems. In this way strengths will be highlighted, weaknesses acknowledged and remedied, and gaps in information required for effective reporting defined. Both the Impact Management Plan and the monitoring programme may need to be amended.

Conclude by reviewing the different responsibilities that stakeholders in the EIA process may have in follow-up activities.

Different stakeholders can be involved in different aspects of monitoring and follow-up activities. For instance:

- responsible authorities make decisions on, and inspect or check implementation of, the terms of the conditions;
- proponents or their agents are responsible for implementing the projects by monitoring the actual effects, implementing remedial measures, and verifying the accuracy of predictions;
- environmental protection agencies as regulatory authorities check compliance with regulations, and verify the effectiveness of mitigation measures; and
- the public can be formally or informally involved in monitoring activities and may highlight inadequacies in monitoring programmes. They may also have practical suggestions to help solve problems as they arise.

Include a training activity to reinforce the topic (if desired).

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Au, E. (1995) *EIA Follow Up and Monitoring*. EIA Process Strengthening Workshop, Canberra
2. Canter, L.W. (1993) The Role of Environmental Monitoring in Responsible Project Management, in *The Environmental Professional*. vol 15. pp. 76-87
3. ECE (1990) *Post Project Analysis in Environmental Impact Assessment*. United Nations. New York.
4. EPA (1995). *Best Practice in Environmental Management in Mining. Environmental Monitoring and Performance* . Canberra
5. Bisset, R. (1996) *EIA: Issues, Trends and Practice.* Environment and Economics Unit UNEP, Nairobi

Sadler, B. (1988) The Evaluation of Assessment: Post EIS Research and Development, in P. Wathern, ed. *Environment Impact Assessment: Theory and Practice.* Unwin Hyman. London pp. 129–142

Further reading

The World Bank (1991) *Environmental Assessment Source Book*. Washington

Ortolano, L. (1984) *Environmental Planning and Decision-making.* Wiley. New York.

Sadler, B. (1996) *Final Report of International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA, Canada.

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

11–1 Why do projects need to be monitored during construction and after they have commenced operation?

11–2 Who should be responsible for the monitoring and followup of projects?

11–3 Is there a role for the public in monitoring?

11–4 How can steps be put into place to ensure that unsatisfactory monitoring results are acted upon appropriately?

11–5 What are the potential concerns about and benefits of releasing monitoring results to the public?

11–6 How can approval agencies link conditions imposed during decision-making with the implementation of a proposal?

11–7 What response should be made to public information that contradicts the results of the proponent's monitoring programme?

Speaker themes

11–1 Invite a speaker with experience in monitoring local projects to outline how the monitoring plans were developed, how often they have been adopted and how successful they have been in practice.

11–2 Invite an expert speaker with specific monitoring expertise of relevance to the participants to provide detailed coverage of the planning, implementation and review of monitoring programmes.

11–3 Invite a speaker with experience in the audit of local EIAs to address the participants, present the findings of the audit and make suggestions for the future improvement of EIAs in the area.

Group Activity 11-1: Monitoring, implementing and auditing

Title	**Preparing environmental monitoring programmes**
Aim	To use an EIA report as the basis for planning an environmental monitoring programme.
Group size	Four or five people, reporting to whole group at end of session.
Duration	Half-day to one day depending on the level of detail required.

Resources required

- An EIA report for each group.
- Local case study example to use as reference (one is provided with the topic if none is available locally).
- Support references such as Ortolano or The World Bank Environmental Assessment Sourcebook to provide the participants with technical and social information about the monitoring of different impacts (see reading list for details). Also search for something less technical to be representative of local monitoring.

Description of activity:

Using the EIA report each group is to:

- Plan an environmental monitoring programme noting:
    - the scope of the monitoring;
    - the objectives of monitoring the impacts;
    - how the information can be collected;
    - the boundaries of the proposed measurement and observation;
    - key indicators to be used for measurement or observation;
    - how the data can be analysed;
    - the level of accuracy required in the data;
    - how the plan can be reviewed;
    - what action is to be taken in the case of problems; and
    - who is responsible for monitoring, paying, checking (auditing).
- Present the results to the whole group.
- Finish with a discussion of the adequacy of the EIA reports for supporting the production of monitoring programmes.
- Discuss how EIA reports could be improved in this regard.

Group Activity 11-2: Monitoring, implementing and auditing

Title	**Reviewing an environmental monitoring programme**
Aim	To critically evaluate the adequacy of a monitoring programme.
Group size	Four or five people
Duration	Half-day

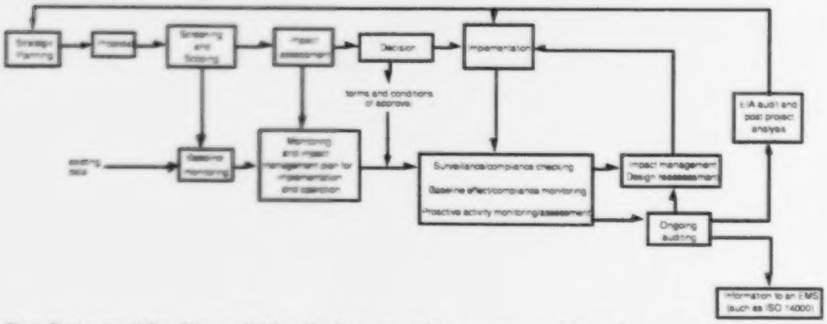
Resources required

- A copy of an environmental monitoring programme per group member.
- The EIA report associated with the programme.
- Support references such as Ortolano or The World Bank Environmental Assessment Sourcebook to provide the participants with technical and social information about the monitoring of different impacts (see Reading list in Section A of the manual for details).

Description of activity:

- The adequacy of the monitoring programme is to be reviewed against the impacts (and their severity) highlighted in the EIA report.
- Suggestions should be made about how the programme (timing, completeness, allocation of responsibility etc) can be improved.
- The findings of the small groups should be reported to the whole group for final discussion.

1


Strategic Planning
Proposal
Screening and Scoping
Impact assessment
Decision
Implementation
terms and conditions of approval
existing data
Baseline monitoring
Monitoring and impact management plan for implementation and operation
Surveillance/compliance checking
Baseline effect/compliance monitoring
Proactive activity monitoring/assessment
Impact management Design reassessment
Ongoing auditing
EIA audit and post project analysis
Information to an EMS (such as ISO 14000)

The Role and Position of Monitoring and Management in EIA ***(Sadler 1988)***

2

Purpose	Examples of Available Tools
systematic approaches to business or organizational management	environmental management systems ISO 14000 series and BS 7750, quality assurance ISO 9000 series
assessing and designing environmentally sound projects and products	environmental impact assessment, risk assessment, life-cycle analysis, technology assessment, total environmental cost assessment
predictive analysis of individual impacts	specific and often highly technical techniques such as modelling of predicted noise levels or changed hydrological conditions
monitoring progress	testing specific parameters to a predefined plan and for a predefined purpose eg. suspended solids, BOD etc for water quality
audit, evaluation and review	often a 'one off' picture of the current environmental conditions used to indicate past or current status eg. compliance audits, EIA audits, contaminated site audit, State of the Environment Reporting

---

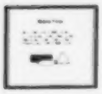
3

EIA monitoring is the planned, systematic collection of environmental data to meet specific objectives and environmental needs.

4

Monitoring programmes:

- document commencing baseline conditions
- monitor compliance with agreed conditions
- review the accuracy of impact prediction
- identify trends in impacts
- review activities and/or mitigation measures
- verify the accuracy of past predictions and the effectiveness of mitigation
- review the effectiveness of the environmental management



5

Before approval establish responsibility for:

- undertaking and paying for monitoring
- managing the monitoring information
- implementing any action required

6

Monitoring provides information on impact:

- nature
- magnitude
- geographical extent
- timescale
- probability of occurrence
- significance
- confidence in prediction

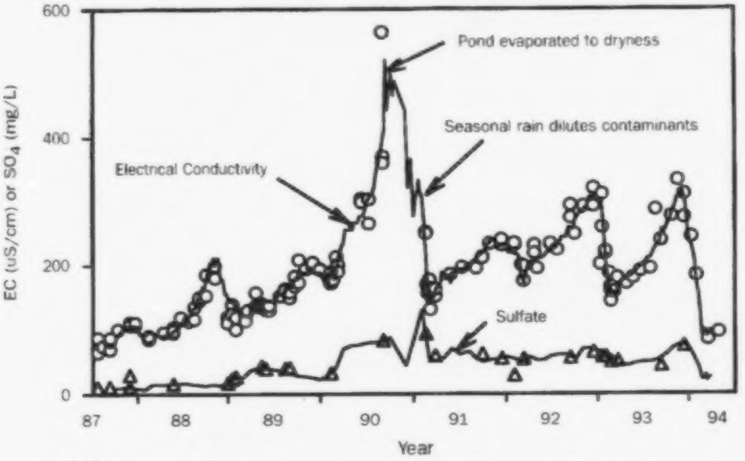
7

Effective monitoring programmes:

- have realistic sampling programmes
- use relevant sampling methods
- collect quality data
- have compatibility of old and new data
- have cost-effective data collection
- are innovative
- use appropriate databases
- use multidisciplinary interpretation
- report internally and have external checks
- respond to third party input
- present data to the public

8

Proponent long-term monitoring showing seasonal variations



EPA, (1995) Δ, O regulator's independent checks of SO_4 and EC respectively

9

Steps in developing a monitoring programme:

- identify the scope
- define the objectives
- decide how information will be used
- define the boundaries and select sites
- select the key indicators
- define how the data will be analysed and presented
- decide the level of accuracy required in the data
- consider the relationship between the new data and existing data
- record and respond to data provided by the community
- set minimum requirements for monitoring

10

Environmental impact assessment audits are a management tool to:

- determine impacts
- check that conditions arising from EIA are being met
- test accuracy of EIA predictions
- identify areas where the EIA could have been improved
- look for improvements to future EIAs

Terminologies Relating to EIA Follow Up

Post decision analysis

Post decision analysis is a generic term for a wide-range for activities that can occur after a decision is made. It refers to environmental studies (ie. data collection and evaluation) undertaken during and following the implementation phases of an activity.

Environmental monitoring

Environmental monitoring refers to the systematic collection of environmental data through a series of repetitive measurements. A number of different monitoring activities are identified below:-

- *Baseline monitoring* refers to the measurement of environmental parameters during a pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of change;
- *Effects monitoring* involves the measurement of environmental parameters during project construction and implementation so as to detect changes in these parameters which can be attributed to the project; and
- *Compliance monitoring* unlike the previous monitoring activities, takes the form of periodic sampling and/or continuous measurement of environmental parameters, levels of waste discharge or process emissions to ensure that regulatory requirements are observed and standards met. (Surveillance and inspection may also form a part of this activity but need not necessarily involve measurement of a repetitive activity).

Environmental audit

Audit is the term, taken from financial accounting, to infer the notion of verification of practice and certification of data. In terms of environmental management, the objectives of audit include:-

- the organisation and interpretation of the environmental monitoring data to establish a record of change associated with the implementation of a project or the operation of an organisation;
- the process of verification that all or selected parameters measured by an environmental monitoring programme are in compliance with regulatory requirements, internal policies and standards, and established environmental quality performance limits;
- the comparison of project impact predictions with actual impacts for the purpose of assessing the accuracy of predictions;
- the assessment of the effectiveness of the environmental management systems, practices and procedures; and
- the determination of the degree and scope of any necessary remedial or control measures in case of non-compliance or in the event that the organisation's environmental objectives are not achieved.

Two audit documents normally required are a *compliance audit*, prepared during the implementation and operation of a project; and a *post-project audit*, prepared after implementation and commissioning of a project.

Post project analysis

This is a general term used to refer to research and supporting activities which take place after a project has been built.

Taken from Elvis Au (1995) *EIA Follow up and Monitoring*

The process of environmental monitoring and performance assessment

GOAL	Demonstrate to governments and the community that the operation complies with environmental quality objectives determined through the EIA process and achieves good environmental performance
Specific Objectives	▪ detect short and long-term trends ▪ recognise environmental changes and analyse causes ▪ measure impacts and compare with predicted impacts ▪ improve the monitoring system ▪ improve practices and procedures for environmental assessment

MONITORING

MONITORING REQUIREMENTS	ENVIRONMENTAL ISSUES
Specific monitoring requirements are developed in the process of preparing an Environmental Management Plan. They include:	The following issues, identified during the EIA process, should be specified:
▪ what to measure	▪ environmental values to be protected
▪ where to measure	▪ potential hazards
▪ when to measure	▪ potential impacts
▪ how to measure	▪ level of acceptable change
▪ evaluation methods to be used	▪ level of risk
▪ additional information required	▪ pathways and impact sites

PERFORMANCE ASSESSMENT

From the monitoring program:	From the assessment:
▪ identify trends, causes and impacts	▪ modify practices and procedures for environmental protection
▪ assess performance and compliance	▪ modify monitoring program

Monitoring Case Study — ERA Ranger Mine Environmental Monitoring Program and Performance Assessment

BEST PRACTICE ENVIRONMENTAL MANAGEMENT IN MINING 'ENVIRONMENTAL MONITORING AND PERFORMANCE' EPA JUNE 1995

Note: The Ranger Uranium mine located in the Kakadu National Park in the Northern Territory of Australia, has monitoring costs of approximately $A 1 000 000 each year due to the sensitivities associated with uranium mining adjacent to the Kakadu wetlands.

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Surface water: • retention ponds • creeks • billabongs • sumps • wetland filters	weekly* monthly* monthly* monthly* as required for research purposes. *daily & weekly during a release	Water samples taken and chemistry analyses completed. Water levels checked via gauge boards and stream gauging.	Results graphed and tabulated for inclusion in reports. Comparisons made with previous reporting period. Collated in quarterly/six monthly water management and annual environmental reports.	Limits established for receiving waters during release of water from retention ponds.	Hydrology and chemistry combined for load calculations during release. Results used in research on wetland filtration, seepage management etc.
Groundwater: • monitoring bores • piezometers • dewatering bores • land application bores	monthly bi-monthly six-monthly some more frequently weekly during irrigation.	Water level in bores measured using dip-meter and piezometer level read. Water samples taken using bore pump.	As above.	Tailings bores and piezometers needed to monitor stability and seepage aspects of tailings dam. Land application (Irrigation) area monitored for mobility of salts and other elements.	Data included in research projects on seepage modelling.
Biological screening: • retention ponds • creeks • billabongs • wetland filter	During wet season prior to and during release of retention pond water. As required for wetland filter research.	Control water obtained from creek. Pond water at a range of dilutions prepared and microscopic aquatic organisms (hydra, cladoceran and fish embryos) used to assess toxicity.	Results tabulated, statistically analysed and included in reports. Internal and external review by government authorities.	Used as part of process to determine dilution rate of release water.	Government standards and safety factor (x10 to x100) before applying the results of toxicity tests.
Soils	Three-yearly.	Collection, preparation, digestion and analysis according to standard methods.	Reported three-yearly and in annual report.	Results compared to historical data.	Monitoring sites are located along drainage channels around the lease area.
Uptake of contaminants by biota: • mussels in creeks • vegetation in land application area.	Annually and on non-regular occasions (eg. for retention pond 2 release).	Mussels sampled from down-stream billabong. Mussel tissue ashed and analysed for contaminant uptake. Vegetation sampled and analysed for contaminant uptake.	Internal and external review by government authorities in the annual report.	Results compared to previous data. Also judged on relevant ANZECC standards for edible criteria.	

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Sediment control	Annual.	Annual erosion survey undertaken and wet season plan prepared for remediation.	Written report/photos, recommendations and budget requirements. Internal review.	Minimise soil loss from mine area and surrounding lease due to disturbance.	Comprehensive pond systems ensures runoff contained in ponds/sediment control structures prior to overflow to creek system.
Weeds	Bi-annual.	Visual inspection to assess success of previous weed control efforts and plan future control of these areas or new outbreaks.	Sketch map prepared and weed control methods planned in liaison with government authorities (Department of Primary Industry & Fisheries) and neighbours in National Park (Australian Nature Conservation Agency). Mission grass main weed problem. Internal review and reporting.	N/A	Encourage use of native species by residents in gardens in Jabiru township via education and supply of plants from Ranger nursery during establishment of town.
Fire	As required.	Control of wildfires during dry season and planned burns conducted late wet season/early dry season.	Research on fires helping to refine timing and nature of burn. Internal review and external review during research field days on site.	N/A	Protection of mine assets and monitoring equipment in surrounding woodland, a key requirement for fire monitoring/management.
Area dust and personal dust	Weekly Daily dependent on level of dust found.	High volume dust samplers and personal samplers are used to collect the sample on a filter paper. Radiometric and gravimetric analyses are undertaken.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	The results from the personal air sampling and the consequent radiological analysis are used to assess radiation exposure due to inhalation of radioactive particles.
Stack emissions	Emissions are measured from the calciner and product packing stacks. Calciner and product packing: monthly. Acid plant: Sulphur dioxide and acid mist emissions are measured from the acid plant stack every three months.	The USA EPA methods for stationary sources are used. A representative sample over a four-hour period is collected from each stack.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	The results are used as inputs for some atmospheric modelling work.

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Radon-222 Progeny Exposure	Weekly and monthly depending on areas monitored.	Automatic area monitors are used to measure average concentrations of ambient radon progeny (decay product of Radon-222 gas). Samples are collected in the immediate operations area and the surrounding environment. Areas are usually monitored for a minimum of 24 hours and up to seven days continuously. Average concentrations are measured every hour at various locations.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	Results from area measurements of radon progeny concentrations are used to calculate employees' radiation dose due to the inhalation of radon progeny.
Gamma Exposure	Personal monitors are used to measure individual employee exposure to gamma radiation. These are worn every day by employees working in the process plant. The monitors are analysed on a quarterly basis.	Worn by employees who are likely to receive the highest exposure to gamma radiation, eg employees who work in the process plant and the mine.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	The monitors are analysed by the Australian Radiation Laboratory and the results combined with the radiation doses from dust and radon progeny to get the total radiation dose to individual employees.
Blasting	Every blast (daily for six months of the year)	A blast vibration monitor is located adjacent to the pit on the southern side to measure the magnitude of each blast.	Chart records from the monitoring device are forwarded to the supervising authority monthly.	All blasting operations shall be conducted so that Mt Brockman and the aboriginal sacred sites in the environs are not damaged.	Mine blasting operations have taken place within the limits set for ground vibration magnitude.
Ore and waste dumping (Restricted Release Zone - RRZ)	Daily during mining phase.	Grade control prior to blasting plus discriminator reading of each truck load for uranium content. Scintillometer measurements over surface of waste and ore stockpiles are made to check only <0.02% uranium is on waste stockpile (outside RRZ boundary).	Grade control plus discriminator records plus calibration. Notebook records of surface checks of radioactivity.	All material with >0.02% uranium must be contained in RRZ for water management purposes.	

EFFECTS MONITORING IN ENVIRONMENTAL IMPACT ASSESSMENT

Peter Duinker

In: *New Directions in Enviornmental Impact Assessment in Canada*, Maclaren,V.W., and Whitney, J.B. Methuen, Toronto. pp. 117-143 1985

INTRODUCTION

Environmental effects monitoring is an aspect of environmental impact assessment (EIA) that is receiving more attention in Canada and abroad. While effects monitoring has normally been mentioned only vaguely in most guidelines for environmental impact statements (EIS), recent guidelines issued under the Environmental Assessment and Review Process (EARP) in Canada have given much more importance to monitoring (e.g., Sable Island Environmental Assessment Panel, 1983). A major Canadian study on the ecological foundations of EIA (Beanlands and Duinker, 1983) has urged widespread adoption of sound monitoring principles in EIA, and has recommended that procedural reforms be enacted to accommodate monitoring formally into the EIA process. Environmental monitoring has been a focus for discussion at recent symposia (e.g. Smith, 1982a) and interdisciplinary workshops (e.g., Canadian Arctic Resources Committee, 1982).

The message on environmental effects monitoring is clear from across the country. According to McCart (1982), "much environmental impact assessment can be considered as Pseudo-science in that hypotheses (Predictions of impact and estimates of their likely severity) are presented but are never tested." Similarly, Hanna (1983) stated that "The current lack of such [adequate pre- and post construction] data is the single greatest obstacle to advancing the state of the art in "environmental impact prediction." And most recently, Beanlands and Duinker (1983) concluded that "we must have some degree of ecological investigation during the construction, operation, and abandonment phases of development projects if we are to improve our capabilities in impact prediction and assessment".

The preceding statements reveal the importance of effects monitoring as a critical element of EIA, and also hint that EIA to date has not been characterised by well-designed, conclusive monitoring studies. This paper will explore the concept of environmental effects monitoring with the objective of reinforcing the notion that, in general, EIA will contribute much more effectively to development decision-making when it incorporates scientifically sound effects monitoring studies.

DEFINITIONS AND OBJECTIVES OF EFFECTS MONITORING

Definitions

A wide range of definitions of the term monitoring can be found in the environmental literature of the past decade. Harvey (1981) and Aird (1982) each presented a very useful summary of many of these definitions. The word is often preceded by such modifiers as "biological", "ecological", "environmental", "effects" and others. Even the term biomonitoring is coming into common usage (e.g., Cairns et al., 1979).

It is unfortunate that many definitions of monitoring have attempted to be so comprehensive that the force of the term's simple roots have become diluted. Monitoring ordinarily means measurement over time, or repetitive measurement. Thus, environmental monitoring is considered as repetitive measurement of environmental variables. Environmental effects monitoring is considered to be repetitive measurement of environmental variables to detect changes caused by external influences. The regulation or control of such changes are not part of effects monitoring, but rather are activities which depend on the results of monitoring (Burlington, 1980; Aird, 1982). The implications of adopting this definition are discussed later.

Because of the increasinq popularity of the concept, the term biological monitoring deserves mention. Combining the strengths of several definitions (e.g., Baker, 1976; Cairns, 1979, 1980; Ausmus, 1982; Matthews et al., 1982), biological monitoring is considered here to mean repetitive measurement of the response of biota to changes in their environment, usually for the purpose of early warning of undesirable change. The concept has been linked to the principles of quality control in industry (Cairns, 1980), and is discussed below.

Monitoring is differentiated from the terms surveillance and supervision in EIA as follows (Aird, 1982): monitoring deals with quantitative mensurative activities, whereas surveillance and supervision are considered as observational or inspectional activities for ensuring compliance with terms and conditions in permits and contracts.

It has been suggested that effects monitoring pertains to effects on biota and humans, rather than to all environmental components in general (e.g., Study Group on Environmental Monitoring, 1977). In this interpretation, there are other types of monitoring which are complementary to effects monitoring, or indeed which are essential to the conclusiveness of effects monitoring programmes. Some have referred to these complementary forms of monitoring as source monitoring (measurement of emissions) and ambient monitoring (measurement of deposition and accumulations) (e.g., Study Group on Environmental Monitoring, 1977; Harvey, 1981), or more simply as chemical/physical monitoring (e.g., Cairns, 1979, 1980; Gray, 1980; IMCO et al., 1980; Branson et al., 1981). Most of these authors and others (e.g., Sanders and Suter, 1980) promote the integration of physical/chemical monitoring and biotic response monitoring to strengthen an overall effects monitoring programme. In this paper, no distinction is made between physical/chemical variables and biotic variables in reference to the term effects monitoring.

Any programme of repetitive measurement of environmental variables can be considered as environmental monitoring. However, monitoring of an environmental variable to compare measured values with compliance standards is not a form of effects monitoring. Such monitoring has been referred to as compliance monitoring and regulatory monitoring (Harvey, 1982), and is not discussed further in this paper.

Objectives

To recapitulate, environmental effects monitoring has the broad goal of demonstrating whether a change has occurred in an environmental variable (Sanders, 1980). In EIA, the changes investigated are presumably linked to the development project or activity being assessed. While there is reportedly much misunderstanding (Cowell, 1978) and disparity of viewpoints (Beanlands and Duinker, 1983) on appropriate objectives for effects monitoring, several scientific objectives can be identified (Marcus, 1979, Aird, 1982, Rigby, 1982):

- to test impact predictions and thus further environmental understanding and improve predictive capability;
- to check the effectiveness of mitigation measures;
- to provide early warning of undesirable change so that corrective measures can be implemented; and
- to provide evidence to refute or support claims for damage compensation.

Both the broad goal stated above, and the different specific motives for undertaking effects monitoring, influence the approach to and design of effects monitoring studies in EIA.

Implications of the Definition of Environmental Effects Monitoring

There are two main implications of the definition of effects monitoring as presented above. The first deals with the conceptual design of a monitoring study whose objective is to test for change. An optimal study design when testing for effects of an intervention includes both before intervention and after intervention measurements in both disturbed and undisturbed (control) sites (Green, 1979). Inferences about the occurrence of effects are much weaker when the study design lacks temporal control (in which case there are no pre-disturbance measurements, and inferences must be based on spatial patterns) or spatial control (in which case there are no measurements in an undisturbed area, and inferences must be based on temporal patterns). Finally, the power of a monitoring study to yield evidence of effects when it lacks both spatial and temporal controls is extremely limited.

This has important repercussions for how monitoring is viewed in the context of EIA. Effects monitoring is not only the provision of a time series of measurements of important variables in a disturbed area following a disturbance. Effects monitoring also includes adequate pre-disturbance measurements (often referred to as the baseline, but this term is avoided here), and concomitant measurements in similar areas that will not be disturbed (Hirsch, 1980; Smith, 1982b; Clark et al., 1983; Hanna, 1983). The principles of study design to test hypotheses of environmental change must be observed if effects monitoring will serve its main goal well.

The second implication deals with the timing of monitoring programmes with respect to the timing of an EIS and that of construction and operation of the development project. To suggest that monitoring should begin generally after an EIS has been prepared, or generally after a development has been installed, is to miss the point that the scheduling of monitoring must be in relation to the timing of the particular disturbance of interest. Effects monitoring need only precede the expression of disturbance for the length of time necessary to establish adequately the natural variability of the phenomenon of interest. For example, exploration and construction phases of an offshore hydrocarbon development, such as that occurring in the Beaufort Sea or about to occur on the Scotfan Shelf, may precede operation phases by a few years or even a decade, and the production of an EIS might occur at any time during that sequence. The monitoring programme for effects of platform installation or sea-bed pipeline construction may need to commence years earlier than the beginning of monitoring for oil spill effects. On the other hand, if EIA studies begin only after project construction has begun, monitoring programmes for construction effects will have some difficulty in producing conclusive results because of the lack of a temporal control.

Thus, the urgency with which effects monitoring programmes are planned and instituted once an EIA is underway should depend largely on when the particular perturbations are expected to occur. If EIA studies commence during or after a particular disturbance, it may be expedient to conduct no monitoring study for that disturbance, especially if a spatial control is impossible to establish. However, if EIA studies commence during project planning, and operation may not commence for some years, there is often ample time to design and implement a sound monitoring study of operation-phase effects.

A NICHE FOR EFFECTS MONITORING IN EIA

Monitoring has traditionally been considered as the post-EIS or post-construction study of impacts as they occur. This notion is abandoned here, so that monitoring includes both adequate pre-disturbance and post-disturbance measurement to determine whether a change has occurred. Monitoring is certainly not the only type of investigation to be undertaken in an EIA. If EIA can be regarded as "a process or set of activities designed to contribute pertinent environmental information to project or programme decision-making", (Beanlands and Duinker, 1983), then it becomes obvious that EIA must include studies the results of which can be used as a basis for predicting effects. Studies to aid impact prediction include reconnaissance surveys for ecological characterisation, resource inventories and surveys, "baseline" studies, quantitative modelling studies, laboratory and field experiments, and case studies of other recent developments. Effects monitoring studies are not part of this list, because logically predictions must precede the expression of an effect, while effects monitoring must carry on after the expression of an effect. However, effects monitoring is still an essential element for providing information for decision-making. Specifically, the results of effects monitoring studies can be used in decisions pertaining to (i) project operation and elements of project design which can be altered even after commissioning, and (ii) future developments expected to result in similar effects.

It is useful to trace through the major steps of an ecological approach to EIA to examine the role of effects monitoring in relation to other activities. The model developed by Beanlands and Duinker (1983) and further refined by Duinker (1983a) is used as a guide. Initially, once an EIA is commenced, a public, "scoping" exercise is undertaken to identify an initial set of environmental components which will serve as a focus for the assessment. For each of these components, the significance of any changes in their abundance, distribution or character, and the spatial and temporal boundaries for the impact analysis are then established. Subsequently, the investigators explore the need and possibilities for studying and predicting the interactions between the proposed project and the selected environmental components. Effects monitoring studies may be included as part of the study strategy for any of the environmental components, particularly when (i) confidence in predictions is expected to be low, (ii) mitigation for expected effects is novel and untasted, (iii) the component is in great need of protection and early signs of effect are required, and/or (iv) the conditions for establishing temporal and spatial controls and for accurately measuring the variable of interest are favourable. The study strategy for any environmental component may also include any combination of the other types of studies listed above as aids to prediction.

PAST PERFORMANCE

EIA has been carried out at the federal level in the U.S.A. for more than a decade, and in Canada for just less than a decade, with thousands of projects in the U.S.A. and tens of projects in Canada having been assessed. Many states in the U.S.A. and nine of Canada's ten provinces also have EIA procedures which have administered reviews of numerous additional EIAs. It is safe to say that the majority of the projects assessed have been approved in some form and been implemented. Consequently, there should be no shortage of opportunity to examine our past performance in undertaking effects monitoring studies in EIA.

However, the situation is complicated by two factors. First, monitoring has traditionally been considered to comprise only post-EIS investigation. Secondly, in most government EIA procedures, formal public review of an EIA has usually been terminated once an EIS has been reviewed and a decision on project approval handed down. Thus, documents arising from most EIAs are appropriate sources of information on pre-EIS study and impact predictions, but usually provide only proposals for effects monitoring programmes. To find out about actual effects monitoring, it is normally necessary to direct inquiries to individuals in industry and/or government who are associated with *environmental* matters pertaining to the project assessed. As a result, there has been less than adequate review of effects monitoring programmes in EIA compared to the reviews available on other aspects of EIA such as pre-EIS study, predictions, and public input.

Nevertheless, the author's experience in discussing EIA with numerous individuals across Canada (Beanlands and Duinker, 1983), and subsequent review of pertinent literature point to a dismal record for effects monitoring in EIA. On the whole, very little effects monitoring has been undertaken in Canada in association with EIA. Guidelines for the preparation of EISs, as mentioned earlier, usually call for a description of proposed monitoring plans, and in this respect some guidelines are beginning to reflect the increased importance being attached to effects monitoring. In EISs, the discussion on monitoring programmes has ranged from short platitudinous discourses to detailed descriptions of study designs for monitoring many environmental components.

The situation is similar in the U.S.A. Marcus (1979) noted that impact monitoring was seldom implemented because of (i) weak requirements under the National Environmental Policy Act to do so, (ii) the perception that too much money and time would be diverted from other essential programmes, and (iii) a lack of institutional coordination mechanisms for inter-governmental monitoring programmes. Gore et al. (1979) reviewed aquatic monitoring programmes that were part of EIAs for three nuclear power installations in the U.S.A. and found consistent inadequacies in (i) allocation of study effort among environmental components, (ii) objectives setting, (iii) sampling designs, (iv) consistency of data collection procedures, and (v) attention to spatial controls.

Finally, in a British study of post-development audits to test the effectiveness of environmental impact prediction methods and techniques (Clark et al., 1983), researchers found that one of the main reasons why so few predictions could be tested was the absence of useful monitoring data. Monitoring was either not undertaken or was not aimed at testing the predictions made.

SCIENTIFIC ISSUES

Conceptualization

It cannot be overstated that problem conceptualization and objective setting are the key initial elements in undertaking a successful environmental effects monitoring study (Cowell, 1978; Green, 1982; Hanna, 1983). Beanlands and Duinker (1983) advised impact analysts to expend a great deal of effort in planning and designing studies before embarking on sampling programmes. Green (1979) stated very eloquently in the first of ten principles of environmental study design:

> Be able to state concisely to someone else what question you are asking. Your results will be as coherent and as comprehensible as your initial conception of the problem.

Thus, it is clear that "attention to the detail of data collection is no substitute for beginning monitoring exercises with a clear conceptual framework that is practical and feasible" (Anonymous, 1982).

Effective conceptualisation of a monitoring study requires a clear understanding of the problem from a decision-making point of view, and a thorough examination of the scientific principles and theory that apply in investigating solutions to the problem. It involves a thought process that translates the very general nature of the problem into specific hypotheses that can be tested. It is recommended here that the development of any environmental effects monitoring programme be halted and thoroughly reviewed, in a peer review sense, at the stage where conceptualization and problem formulation are considered complete. Such a review would examine whether the study was indeed headed in an appropriate, conclusive direction.

Natural Variability

Natural variability in time and space is of critical importance in determining the possibility for, and means of, monitoring effects on ecological phenomena. Indeed, any effects monitoring study attempts to separate changes attributable to the development being assessed from heterogeneities which may occur or exist naturally. The variation in natural systems generally occurs as chaotic randomness and/or as organized gradients (Munn, 1982), and monitoring studies must account for such variation through the use of appropriate sampling patterns and "control" or "reference" stations. Of course, study design must also be cognizant of errors and variability introduced specifically by the activities of sampling and measurement.

There is ample literature on ways of dealing with natural variability in environmental monitoring studies (e.g., Eberhardt, 1976, 1978; Green, 1979; Skalski and McKenzie, 1982; Bernstein and Zalinsky, 1983; and numerous others). Impact analysts must recognize that failing to treat natural variation in a rigorous manner will seriously jeopardize the capability of any environmental monitoring study to test hypotheses of effect.

Hypothesis Setting and Statistical Tests

Field sampling programmes in effects monitoring studies must be designed to meet the requirements of the statistical analysis appropriate to test hypotheses developed early in the studies. Such studies are usually destined for the realm of the inconclusive if the hypotheses and the statistical procedures to test them are established only after field data are in hand. Again, the literature provides such a plethora of advice on these topics that they need not be re-examined here. Of particular relevance in the context of this paper is that the hypotheses to be tested in monitoring studies are essentially predictions of effects. Thus for a given prediction, with certain "ideal" informational qualities (Duinker, 1983b), a falsifiable hypothesis should be developed and a sampling design and statistical test chosen to test it. Of importance here is to specify the probability of detecting a change of the magnitude predicted, since both of these are major determinants of the sampling design to be used (Bernstein and Zalinsky, 1983).

Such procedures (e.g., power tests) should be applied by impact analysts to determine whether impact predictions can actually be tested with the resources available. If not, analysts should certainly re-direct study resources to questions that can feasibly be answered, and failing this possibility do no effects monitoring studies at all.

Biomonitoring for Early Warning

Although the concept of monitoring the response of biota to changing physical and chemical conditions for the purpose of environmental quality control is considered by some (e.g., Smith, 1982b) to be at a rudimentary level, recent literature has been promoting the concept (e.g., Cairns and van den Schalie, 1980; Worf, 1980; Committee on the Atmosphere and the Biosphere, 1981). The principle is that a system cannot be properly managed without continual feedback of information on its condition. Cairns (1980) urged the use of biomonitoring for the provision of information on the quality of the natural environment, and suggested that the characteristics of industrial quality control programmes should serve as a guide: (i) sensors are placed at critical points throughout the system; (ii) information is generated rapidly about the condition of the system; and (iii) organization and mechanisms are in place to rectify undesirable conditions as they occur. Consideration should be given in every EIA to the possibilities for implementing effects monitoring programmes, based on the guidelines above, to provide information for controlling undesirable effects.

INSTITUTIONAL/PROCEDURAL ISSUES

EIA Procedures

Most of the EIA procedures administered by the federal and provincial governments in Canada incorporate some form of "requirements" that monitoring be undertaken following project approval. Yet the formal review mechanisms embodied in these Procedures usually terminate at the point when decisions on project approval are made. Thus, since the mechanisms for ensuring that effects monitoring is undertaken are weak, and since the attention and assessment resources of government, industry and the public often are quickly diverted to other more current, high-profile environmental problems, effects monitoring seldom has become an important component of any EIA. This is ironic in light of observations made earlier that *effects* monitoring is essential in EIA for the purposes of (i) providing information for decisions on changeable aspects of a development, and (ii) improving the knowledge base for future decisions of a similar kind.

A procedural stimulus is needed before effects monitoring studies will become a regular feature of EIAs in Canada, and such a stimulus is probably best provided through continuation of formal review of an EIA beyond project approval.

Responsibility and Cooperation

There is a great deal of argument within the Canadian EIA community over who should pay for, carry out and review EIA monitoring studies. While the responsibilities of most of the parties involved in pre-approval EIA are clearly designated (e.g., proponents pay for and prepare EISs, government agencies set guidelines and review studies), debate exists over responsibility for any post-approval effects studies.

The debate is not resolved here. Rather, some observations are made. It appears that both industry and government stand to gain when creatively designed effects monitoring studies yield fairly conclusive results on the actual effects of specific developments. Such information is usually relevant to both the development at hand and future developments of a similar nature. Since the resources available for effects monitoring are not boundless, it would seem entirely appropriate that cooperative ventures be undertaken. This may entail cooperation between industry and government, for which there is ample precedent in environmental studies and which has been strongly encouraged recently (Duinker and Beanlands, 1982). Alternatively, it may entail cooperative effort within a particular branch of industry. An example of this is embodied in the recently created Environmental Studies Revolving Funds (ESRF), two multi-million dollar funds provided by the Canadian oil and gas industry and administered by the Government of Canada. The funds were created to distribute equitably among offshore oil and gas operators the costs of environmental studies the results of which are useful to all the companies operating in a region. Because they can further predictive capability for the benefit of the Canadian oil and gas industry as a whole, effects monitoring studies are clearly within the domain of studies to be funded by ESRF (Canadian Arctic Resources Committee, 1982).

As a final note, it seems also that effects monitoring will be undertaken by any party - government, industry or otherwise - that is convinced that the value of the results is worth the effort and expenditure required. In this vein, Cowell (1978) argued that ecological effects monitoring is a very valuable management tool for the oil and gas industry, and should be undertaken even without any regulatory requirements to do so.

CURRENT EFFECTS MONITORING PROGRAMMES

Three effects monitoring programmes in Canada which demonstrate a range of assumed responsibility are now described. In all three cases, the examples portray an appreciation of the importance of pre-perturbation study and a realization of the utility of the results to environmental decision-making in general.

White Whale Monitoring Programme

Petroleum exploration and development activities have been taking place for some years in the MacKenzie River Estuary region in Northern Canada. A proposal for large-scale hydrocarbon development in the area and the adjoining Beaufort Sea is currently under environmental assessment (Dome Petroleum et al., 1982). White whales are an important species hunted by the Inuit in the area, and oil companies have sponsored a white whale monitoring study in the estuary since 1972 (Norton Fraker, 1983). The general goals of the programme are to document the arrival, initial distribution and abundance of whales in the estuary, and to detect interference of industrial activity with the annual whale hunt. More specifically, scientific objectives have been included (i) to determine when ice conditions permit the whales access to the estuary, (ii) to estimate the maximum number of whales, (iii) to document the number of whales, vessel traffic, and hunting success, and (iv) to record sightings of whale responses to human activity.

Survey methods were standardized in 1976, giving eight consistent survey seasons to this time of writing. Analysis of the data has revealed no apparent relationship as yet between whale distribution and abundance, level of industrial activity, and hunting success.

Point Lepreau Environmental Monitoring Programme

An EIA was undertaken for the Point Lepreau Nuclear Generating Station in New Brunswick in the mid-1970s as one of the first projects assessed under EARP. The project began operation in early 1983, but the Atlantic Environmental Radioactivity Unit of the Chemical Oceanography Division at the Bedford Institute of Oceanography (Canada Department of Fisheries and Oceans) began an environmental monitoring programme in 1980 to provide government with a sound scientific basis for assessing the environmental implications of operating nuclear reactors in coastal regions (Smith et al., 1981, 1982). The studies have been designed (i) to document the distribution of radioactivity in various components of the biophysical environment, (ii) to identify pathways of radioactivity through the environment, and (iii) to determine the fluxes along those pathways.

In this programme, pre-operational monitoring has taken place for three years to characterize background radioactivity conditions. Bottom and surface drifters have been used to track water circulation in proximate areas of the Bay of Fundy, and water and sediment samples have been tested for radionuclide content. For the atmosphere, basic data have been collected for dispersion and transport modelling and samples of water vapour and particulates have been tested for radionuclides. Finally, several species of marine and terrestrial biota have been selected as indicators of radioactivity in the biota in general, and have been sampled and tested for background radiation.

The monitoring programme will continue for several years during operation of the reactor to provide sufficient data to document the dispersion of radioactivity from the plant.

Caribou and the Upper Salmon Hydroelectric Development

In the EIA for the Upper Salmon Hydroelectric Development in Newfoundland (Newfoundland and Labrador Hydro, 1980, 1981), it was clear from the beginning that effects of the development on local caribou herds could not be predicted with reasonable reliability. With the cooperation of the Newfoundland Wildfire Division (Mahoney, 1980), a study was designed to embrace a minimum of six years of measurements, beginning two years before construction commenced and continuing at least two years after operation began.

Specifically, the hydroelectric project lies directly on an historical caribou migration path between winter and summer ranges with important calving and post-calving areas in the immediate vicinity. The concern arose about whether the project might interfere with annual migration to the extent that the status of the herds may be jeopardized.

The first year studies were the most comprehensive. Both spring and winter censuses were undertaken using a combination of census techniques. Extensive aerial observations were then used to document herd structure. Radio collars were attached to approximately 100 caribou which were tracked throughout the year. An interpretation of the data provided details of the migratory habits and various behavioural characteristics of the herds.

The radio-collaring programme has continued annually with a smaller number of animals. The proponent initiated a complementary study to provide field observations of caribou responses to particular project elements and activities such as blasting, vehicular traffic, and physical structures. The study focussed especially on the very vulnerable post-calving stage when does and calves move through the project area. Information was gathered on caribou time budgets, cow-calf interactions, and alarm reactions in relation to the construction activities of the project.

Once complete, the entire caribou study is expected to demonstrate if the construction and presence of the hydroelectric project have interfered with established patterns of caribou behaviour that could possibly translate into substantial declines in the sizes of the herds.

CONCLUSIONS

It is clearly necessary to distinguish between monitoring done for regulatory purposes and environmental effects monitoring related to EIA. EISs in the past have often described proposed monitoring programmes most of which would be required of the proponent even in the absence of an EIA. Effects monitoring studies are those which rely on optional study designs to test rigorously hypotheses (predictions) of the effects of specific environmental interventions.

There is a deep sense within the EIA community in Canada of the need for sound environmental effects monitoring studies to complement other EIA investigations. In order to foster wider application of the concept, the following stimuli will be needed:

- extension of EIA review procedures and formal requirements beyond the acceptance of an EIS and project approval;
- several precedents in which well-designed effects monitoring studies have provided much needed information as a basis for environmental decisions;
- general acceptance of the notion that not all projects, and not all impacts of any one project, need to be comprehensively and intensively monitored (Moore and Mills, 1977; McCart, 1982; Beanlands and Duinker, 1983) (To avoid becoming an excessive drain on time and resources, effects monitoring should be focussed on environmental components (i) that are most important to decision making, (ii) that are most poorly

understood, and (iii) in which changes of the type and magnitude predicted can realistically be detected); and

- general acceptance of the notion that both government and industry have a stake in the results of most effects monitoring studies, and that cooperation in such studies by pooling expertise, funds and logistical support is an acceptable way to increase the chances of conducting meaningful investigations.

Regarding monitoring studies themselves, investigators are reminded that (i) effects monitoring includes not only the measurement of an environmental component in an altered condition, but also the pre-perturbation condition of that component as well as spatial controls whenever possible, and (ii) the timing of a monitoring study is correctly linked to the timing of the perturbation and the natural variability of the environmental component of interest, and not to the timing of the EIS. With careful attention to problem conceptualization, hypothesis setting, natural variability, sampling design and statistical analysis, effects monitoring studies in EIA will indeed begin to increase the predictive capability of impact analyses and improve environmental decisions.

ACKNOWLEDGEMENTS

During the preparation of this paper, the author was supported first as a Research Associate at the Institute for Resource and Environmental Studies, Dalhousie University, Halifax, Nova Scotia, and subsequently as recipient of an NSERC Postgraduate Scholarship at the Faculty of Forestry, University of New Brunswick. Thanks are extended to Sharon Flinn and Faye Forrester for typing the manuscript.

REFERENCES

Aird, R. (1982), Environmental Monitoring of Project Impacts: Regulatory Recruitments and Developing Concepts and Approaches. (Calgary: Petro-Canada, Graduate Student Monograph No. 15).

Anonymous. (1982), Post-project analysis in environmental impact assessment. (ENV/GE.I/R.2, Discussion document for Group of Experts on Environmental Impact Assessment, Senior Advisors to ECE Governments on Environmental Problems, Economic Commission for Europe, U.N. Economic and Social Council).

Ausmus, B.S. (1982), "Terrestrial monitoring–where to monitor", in S.B. Smith (ed,), Symposium on Environmental Monitoring (Edmonton: Alberta Society of Professional Biologists): 51-90.

Baker, J.M. (1976), "Biological monitoring - principles, methods and difficulties", in J.M. Baker (ed.), Marine Ecology and Oil Pollution (New York: John Wiley and Sons, Inc.): 41-53.

Beanlands, G.E. and Duinker, P.N. (1983), An Ecological Framework for Environmental Impact Assessment In Canada (Halifax: Institute for Resource and Environmental Studies, Dalhouse University, and Hull: Federal Environmental Assessment Review Office).

Bernstein, B.B. and Zalinsky, J. (1983), "An optimum sampling design and power tests for environmental biologists", Journal of Environmental Management, 16:35-43.

Branson, D.R., Armentrout, D.N., Parker, W.M., Hall, G.V., and Bone, L.I, (1981), "Effluent monitoring step by step", Environmental Science and Technology, 15:513-518.

Burlington, J.D. (1980), "A review of environmental data and monitoring", in D.L. Worf (ed.), Biological Monitoring for Environmental Effects (Lexington: D.C. Heath and Company): 5-10.

Cairns, J. Jr. (1979), "Biological monitoring concept and scope", in J. Gairns Jr., G.P. Patil and W.E. Waters (eds.), Environmental Biomonitorinq, Assessment, Prediction and Management - Certain Case Studies and Related Quantitative Issues (Fairland, Maryland: International Cooperative Publishing House): 3-20.

Cairns, J. Jr. (1980), "Scenarios on alternative futures for biological monitoring", in D.L. Worf (ed.), Biological Monitoring for Environmental Effects (Lexington: D.C. Heath and Company): 11-21.

Cairns, J. Jr. (1981), "Biological monitoring, Part VI - future needs", Water Research, 15:941-952.

Cairns, J. Jr., Patil, G.P. and Waters, W.E. (ed.) (1979), Environmental Biomonitoring, Assessment, Prediction and Management: Certain Case Studies and Related Quantitative Issues. (Fairland, Maryland: International Cooperative Publishing House).

Cairns, J. Jr. and van den Schalie, W.H. (1980), "Biological monitoring. Part I - early warning systems", Water Research, 14:1179-1196.

Canadian Arctic Resources Committee (1982), The Environmental Studies Involving Offshore Oil and Gas. (Ottawa: Canadian Arctic Resources Committee).

Clark, B.D., Bisset, R., and Tomlinson, P. (1983), Post-Development Audits to Test the Effectiveness of Environmental Impact Prediction Methods and Techniques. (Aberdeen, Scotland: PADC Environmental Impact Assessment and Planning Unit, Department of Geography, University of Aberdeen).

Committee on the Atmosphere and the Biosphere (1981), Atmosphere-Biosphere Interactions: Toward a Better Understanding of the Ecological Consequences of Fossil Fuel Combustion, (Washington: National Academy Press).

Cowell, E.B. (1978), "Ecological monitoring as a management tool in industry", Ocean Management, 4:273-285.

Dome Petroleum Ltd., Esso Resources Canada Ltd., and Gulf Canada Resources Inc. (1982), Environmental Impact Statement for Hydrocarbon Development In the Beaufort Sea-Mackenzie Delta Region. (Calgary: Dome Petroleum Ltd. et al., 9 volumes).

Duinker, P .N. (1983a), "Some comments on the scientific basis of environmental impact assessment", in Proceedings, Environmental Impact Assessment Conference. (Toronto: Corpus Information Services Ltd.).

Duinker, P.N. (1983b), The Prediction of Environmental Impacts: A Discussion Paper. (Hull, Quebec: Federal Environmental Assessment Review Office).

Duinker, P.N. and Beanlands, G.E. (1982), "Environmental impact assessment procedures in Canada: improvements from a scientific perspective", in ICOE'82 Conference Proceedings Part B (Halifax: Technical University of Nova Scotia): 145-150.

Eberhardt, L.L. (1976), "Quantitative ecology and impact assessment", Journal of Environmental Management, 4:27-70.

Eberhardt, L.L. (1978), "Appraising variability in population studies", Journal of Wildlife Management, 42:207-238.

Gore, K.L., Thomas, J.M. and Watson, D.G. (1979), "Quantitative evaluation of environmental impact assessment, based on aquatic monitoring programs at three nuclear power plants", Journal of Environmental Management, 8:1-7.

Gray, J.S. (1980), "Why do ecological monitoring?" Marine Pollution Bulletin, 11:62-65.

Green, R.H. (1979), Sampling Design and Statistical Methods for Environmental Biologists. (Toronto: John Wiley and Sons, Inc.).

Green, R,H, (1982), "Statistical and nonstatistical considerations for environmental monitoring studies", in S.B. Smith (ed.), Symposium on Environmental Monitoring (Edmonton: Alberta Society of Professional Biologists): 131-148.

Hanna, J.E. (1983), A Review of the Environmental Assessment, Resource Allocation, and Associated Decision-making Processes in Northern Ontario. (Toronto: Canadian Society of Environmental Biologists, Ontario Chapter, for Royal Commission on the Northern Environment).

Harvey, T. (1981), "Environmental intervention: the monitoring paradigm. 1. The monitoring concept and the practice of descriptive monitoring", The Environmentalist, 1:283-291.

Harvey, T. (1982), "Environmental intervention: the monitoring paradigm. 11. Regulatory monitoring and the development of a management model", The Environmentalist, 2:307-319.

Hirsch, A. (1980), "The baseline study as a tool in environmental impact assessment", in Symp. Proc., Biological Evaluation of Environmental Impacts (Washington: Council on Environmental Quality, and Fish and Wildlife Service, U.S. Department of the Interior; FWS/OBS-80/26): 84-93.

IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) (1980), Monitoring Biological Variables Related to Marine Pollution. (Paris: UNESCO; Report and Study No. 12).

Mahoney, S.P. (1980), The Grey River Caribou Study. (St. John's: Newfoundland Wildfire Division, and Newfoundland and Labrador Hydro).

Marcus, L.G. (1979), A Methodology for Post-EIS (Environmental Impact Statement) Monitoring. (Arlington, Virginia: U.S. Geological Survey, U.S. Department of the Interior; Geological Survey Circular 782).

Mathews, R.A., Buikema, A.L. Jr., Cairns, J.Jr., and Rodgers, J.H. Jr. (1982), "Biological monitoring. Part 11A - receiving system functional relationships and indices", Water Research, 16: 129-139.

McCart, P.J. (1982), "Aquatic biomonitoring of representative developments", in S.B. Smith (ed.), Symposium on Environmental Monitoring (Edmonton: Alberta Society of Professional Biologists): 169-172.

Moore, R. and Mills, T. (1977), An Environmental Guide to Western Surface Mining. Part Two: Impacts. Mitigation and Monitoring. (Fort Collins, Colorado: Fish and Wildlife Service, U.S. Department of the Interior, FWS/OBS-78/04).

Munn. R.E. (1982), "Principles of network design". (Paper presented at NRC Symposium on Monitoring and Assessment of Airborne Pollutants, September 1982, National Research Council, Ottawa, Canada).

Newfoundland and Labrador Hydro (1980), Upper Salmon Hydroelectric Development: Environmental Impact Statement. (St. John's: Newfoundland and Labrador Hydro, Environmental Policy Department).

Newfoundland and Labrador Hydro (1981), Environmental Information Report (1981): The Upper Salmon Hydroelectric Development. (St. Johns: Newfoundland and Labrador Hydro, Environmental Services Department.

Norton Fraker, P. (1983), The 1982 White Whale Monitoring Program, MacKenzie Estuary. Part 1: Migration, Distribution and Abundance of Whales and Effects of Industry Activities on Whales (Calgary, Alberta: Esso Resources Canada Limited).

Rigby, B .G. (1982), Environmental Impact Assessment and the Need for Environmental Monitoring. (Ottawa: Department of Geography, Carleton University; M.A. Thesis).

Sable Island Environmental Assessment Panel (1983). Guidelines for the Preparation of an Environmental Impact Statement for Gas Production from the Scotian Shelf in the Sable Island Area (Hull, Quebec: Federal Environmental Assessment Review Office, and Halifax: Nova Scotia Department of Environment .

Sanders, F.S. (1980), "Synthesis", in F.S., Sanders and G.W. Suter 11 (eds.), Strategies for Ecological Effects Assessment at DOE Energy Activity Sites (Oak Ridge, Tennessee: Oak Ridge National Laboratory; Environmental Sciences Division Publication No. 1639): 349-377.

Sanders, F.S. and Suter, G.W. 11 (1980), "General considerations for ecological effects monitoring and assessment", in F.S. Sanders and G.W. Suter 11 (eds.), Strategies for Ecological Effects Assessment at DOE Energy Activity Sites (Oak Ridge, Tennessee: Oak Ridge National Laboratory; Environmental Sciences Division Publication No. 1639): 9-60.

Skalski, J.R. and McKenzie, D.H. (1982), "A design for aquatic monitoring programs", Journal of Environmental Management, 14:237-251.

Smith, J.N., Ellis, K. and Bishop, F.J. (1981), Pre-operational Environmental Monitoring Report for the Point Lepreau, NB, Nuclear Generating Station - 1980. (Dartmouth, Nova Scotia: Bedford Institute of Oceanography; Report Series/BI-R-81-10).

Smith, J.N., Ellis, K.M. and Bishop, F.J. (1982), Pre-operational Environmental Monitoring Report for the Point Lepreau, NB, Nuclear Generating Station—1981. (Dartmouth, Nova Scotia: Canada Department of Fisheries and Oceans; Canadian Technical Report of Hydrography and Ocean Sciences No. 4).

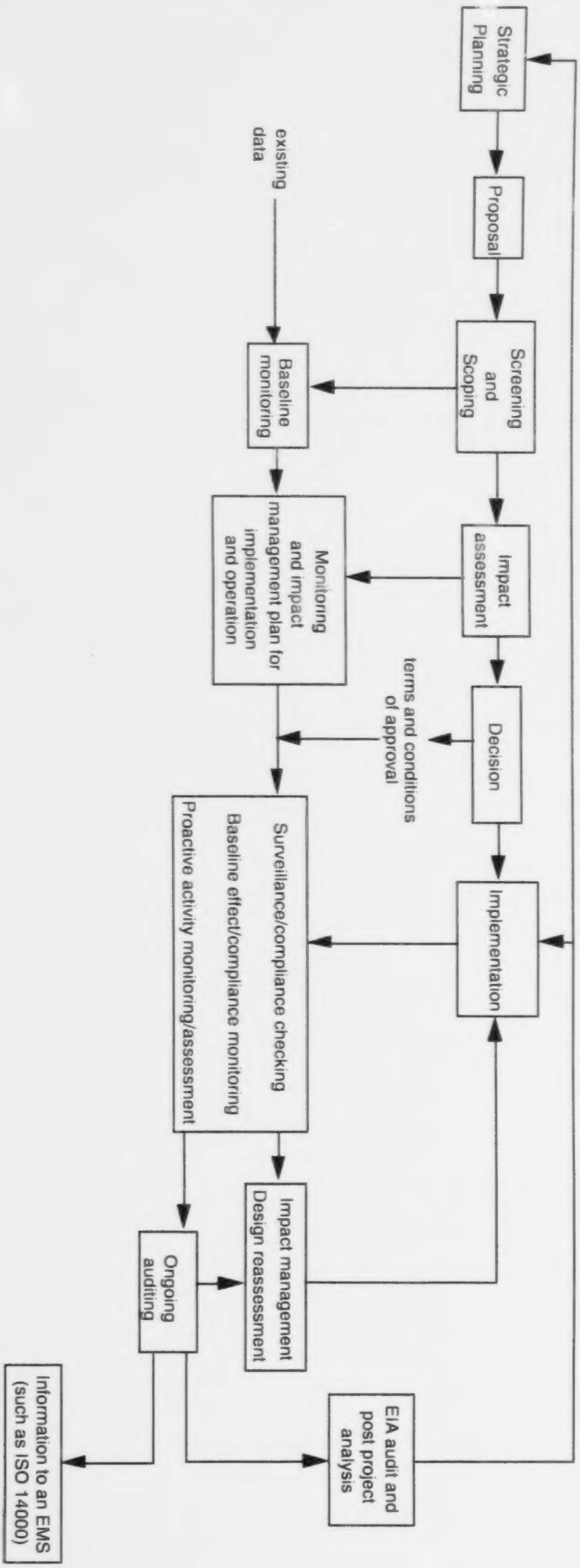
Smith, S.B. (ed.) (1982a), Symposium on Environmental Monitoring. (Edmonton: Alberta Society of Professional Biologists).

Smith, S.B. (1982b), "Symposium summary", in S.B. Smith (ed.), Symposium on Environmental Monitoring (Edmonton: Alberta Society of Professional Biologists): 219-228.

Study Group on Environmental Monitoring (1977), Environmental Monitoring. (Washington: National Academy of Sciences; Vol. IV, Analytical Studies for the U.S. Environmental Protection Agency).

Worf, D.L. (ed.) (1980), Biological Monitoring for Environmental Effects. (Lexington: D.C. Heath and Company).

Diagram showing monitoring as one part of impact management



Strategic Planning

Proposal

Screening and Scoping

Impact assessment

Decision

Implementation

existing data

Baseline monitoring

Monitoring and impact management plan for implementation and operation

terms and conditions of approval

Surveillance/compliance checking
Baseline effect/compliance monitoring
Proactive activity monitoring/assessment

Impact management
Design reassessment

Ongoing auditing

EIA audit and post project analysis

Information to an EMS (such as ISO 14000)

Adapted from Sadler 1988

Monitoring programs can be used to:

Purpose	Examples of Available Tools
systematic approaches to business or organisational management	environmental management systems ISO 14000 series and BS 7750, quality assurance ISO 9000 series
assessing and designing environmentally sound projects and products	environmental impact assessment, risk assessment, life-cycle analysis, technology assessment, total environmental cost assessment
predictive analysis of individual impacts	specific and often highly technical techniques such as modelling of predicted noise levels or changed hydrological conditions
monitoring progress	testing specific parameters to a predefined plan and for a predefined purpose eg. suspended solids, BOD etc for water quality
audit, evaluation and review	often a 'one off' picture of the current environmental conditions used to indicate past or current status eg. compliance audits, EIA audits, contaminated site audit, State of the Environment Reporting

EIA monitoring

EIA monitoring is the planned, systematic collection of environmental data to meet specific objectives and environmental needs.

Monitoring programs

- document commencing baseline conditions
- monitor compliance with agreed conditions
- review the accuracy of impact prediction
- identify trends in impacts
- review activities and/or mitigation measures
- verify the accuracy of past predictions and the effectiveness of mitigation
- review the effectiveness of the environmental management

Before approval establish responsibility for:

- undertaking and paying for monitoring
- managing the monitoring information
- implementing any action required

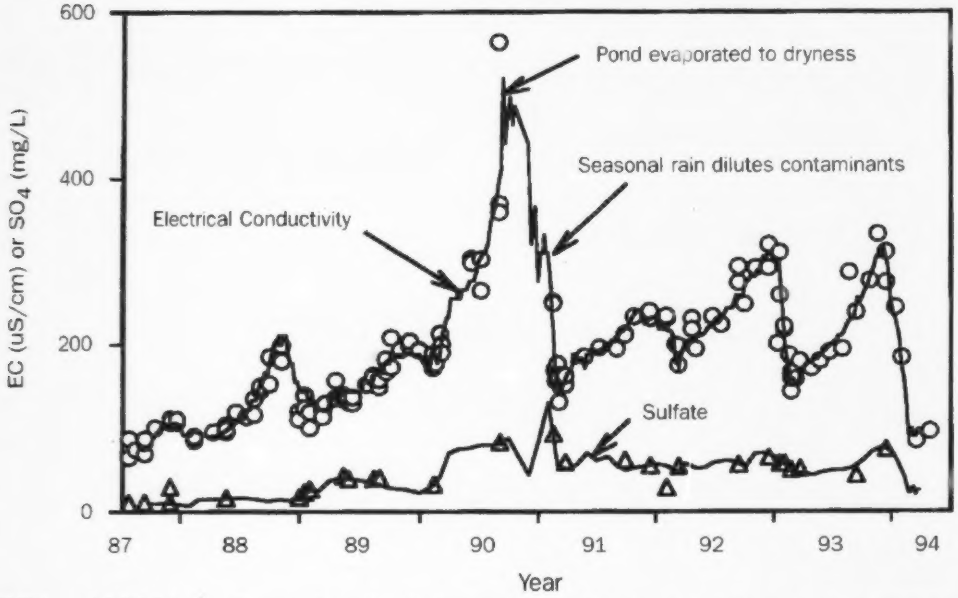
Monitoring provides information on impact:

- nature
- magnitude
- geographical extent
- timescale
- probability of occurrence
- significance
- confidence in prediction

Effective monitoring programs:

- have realistic sampling programs
- use relevant sampling methods
- collect quality data
- have compatibility of old and new data
- have cost-effective data collection
- are innovative
- use appropriate databases
- use multidisciplinary interpretation
- report internally and have external checks
- respond to third party input
- present data to the public

Proponent long-term monitoring showing seasonal variations



EPA, (1995) Δ, O regulator's independent checks of SO_4 and EC respectively

Steps in developing a monitoring program:

- identify the scope
- define the objectives
- decide how information will be used
- define the boundaries and select sites
- select the key indicators
- define how the data will be analysed and presented
- decide the level of accuracy required in the data
- consider the relationship between the new data and existing data
- record and respond to data provided by the community
- set minimum requirements for monitoring

Environmental impact assessment audits are a management tool to:

- determine impacts
- check that conditions arising from EIA are being met
- test accuracy of EIA predictions
- identify areas where the EIA could have been improved
- look for improvements to future EIAs

Topic 12—Project Management

Objective

To explore with participants the importance of EIA project management and the varied roles and responsibilities of EIA project managers. To outline the skills and knowledge a person might need to successfully carry out these functions.

Relevance

EIA project management is complex and demanding. It requires both specialist skills and a considerable amount of commitment. Not all practitioners are suited to the role of project manager, nor can the work be done in isolation. All practitioners, however, require an understanding of the project management role and the differences in this role depending upon the interests of the organization for which the EIA project manager works (proponent, consultant, government agency, donor agency).

Timing

Three hours (not including training activity)

☑ Information checklist

Obtain or develop the following materials, as appropriate:

- ☐ examples of EIA project schedules and budgets for local projects ;
- ☐ examples of the management structure of teams that have prepared EIA reports for local projects;
- ☐ contact names and telephone numbers of people, agencies and organizations, and environmental information/data resource centres who may be able to provide assistance in relation to the management of EIAs; and
- ☐ other resources that may be available such as courses in specific analytical or methodological techniques, videos, journal articles, computer programmes, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives and why they are important.

This topic explores the importance of EIA project management and the varied roles and responsibilities that EIA project managers might have. It outlines the skills and knowledge a person might need to successfully carry out these functions.

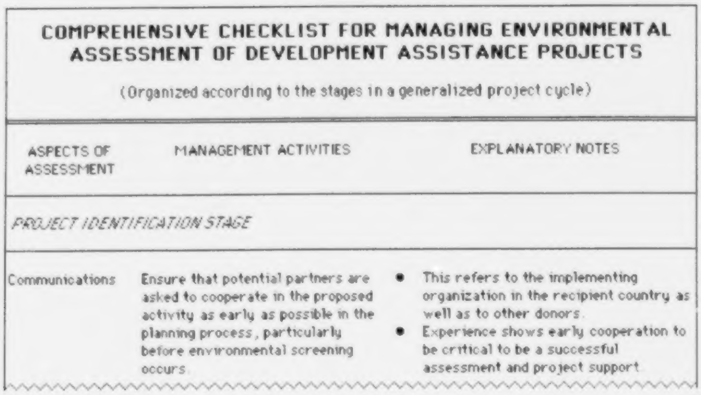
Introduce the concept of EIA project management and the importance of its role in the EIA process.

The main purpose of EIA project management is to manage proposals in such a way that the environment is protected while still maximising the other economic and social goals of the project. While the immediate objective of EIA project management may be the production of a successful environmental document, the longer term goal of project management is to manage the environment through the environmental assessment process. It is important to understand that EIA is supposed to be a total environmental process that puts a proposal in proper perspective within its total natural environment. EIA produces better proposals – proposals that last, are technically viable, and consume only as many resources as necessary. These proposals are less wasteful, bring a better long-run economic return and do less harm to the environment. Most importantly, environmentally sound proposals are more likely to be sustainable, guarding scarce resources and guaranteeing future development.

There are many players in the EIA process: political parties, donor agencies, consulting firms, review and regulatory agencies, numerous non-government bodies, academics, the media, and the public. Each of these becomes in some way clients of the EIA project manager, who needs to understand and take account of their often varying needs and demands.

Using Handout 1, the OECD/DAC*Comprehensive Checklist for Managing Environmental Assessment of Development Assistance Projects*, work through the range of tasks for which the EIA project manager may be responsible.

12–1



COMPREHENSIVE CHECKLIST FOR MANAGING ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT ASSISTANCE PROJECTS

(Organized according to the stages in a generalized project cycle)

ASPECTS OF ASSESSMENT	MANAGEMENT ACTIVITIES	EXPLANATORY NOTES
PROJECT IDENTIFICATION STAGE		
Communications	Ensure that potential partners are asked to cooperate in the proposed activity as early as possible in the planning process, particularly before environmental screening occurs.	• This refers to the implementing organization in the recipient country as well as to other donors. • Experience shows early cooperation to be critical to be a successful assessment and project support.

Encourage the participants to develop a list of attributes they feel describe a good project manager. Explore why these are important.

To be effective, the EIA team needs strong support from the project manager and very clear agreements on what is to be achieved, what the deadlines are, how money and resources will be allocated, who does what, and who reports to whom.

1

The points below outline some of the features of good project managers. They are people who:

- have solid technical skills;
- are action-oriented;
- are team leaders;
- are willing and able to learn from others;
- are good communicators;
- are good negotiators; and
- are proficient in planning and budgeting.

Technically skilled

A successful EIA project manager has a good understanding of the technical and social complexities of the environmental consequences of the project. This is necessary even with the help of an 'interdisciplinary team'. There is little point in appointing a project manager who is not an experienced EIA practitioner.

Action-oriented

Project managers need to be action oriented as deadlines are often very tight. Good project managers move ahead quickly, in the directions they consider reasonable, and then correct these directions as required. Excessive caution in the early stages delays the time for this sort of correction.

Team leader

To command the respect of the team the project manager must have a clear idea of what is to be done, good management skills, the ability to motivate team members, integrity, and good judgement.

Able to learn from others

The project manager is likely to be a generalist rather than a specialist, but needs to know enough about each of the specialisations to win the respect of the specialist team.

Good communicator

EIA management involves information management. It is critical that the project manager communicates well with management, policy makers, and staff.

Good negotiator

It is the project manager's job to get resources for the assessment, to get the best out of team members, and to negotiate compromises between numerous stakeholders.

Proficient in planning and budgeting

An experienced practitioner once said 'Once you get organized, the rest of the job is not too difficult. At least, the job is not as difficult as it will be if you start off disorganized!'

Outline the typical role of the EIA project manager. Ask the participants if there are other roles that they have encountered.

The project manager, as the team's leader, needs considerable interpersonal skills. A major part of the job is visualising the larger picture within the environmental impact study and supporting, building confidence, communicating, leading, asking the right questions, and allowing the team members to organize and carry out work in ways which are appropriate to the individual while insisting on quality control. In the end, it is the project manager who makes and conveys management decisions that must often be made in the face of risk and uncertainty, and with minimum information.

2

The role of the project manager depends to some extent on who the project manager works for. There are, however, typically certain core roles, including:

- establishing the purpose of the EIA, understanding the issues involved as well as understanding the receiving environment;
- defining tasks and developing appropriate work programmes;
- establishing and managing a budget;
- establishing the management structure, and producing organizational charts;
- setting time schedules;
- selecting an interdisciplinary team for the impact investigations;

- arranging contracts, defining the roles of each team member, the products required, the methods of delivery, quality and standards of work and payment procedures;
- co-ordinating a public involvement programme;
- managing and co-ordinating the information generated by the study; and
- providing the results and recommendations of the EIA in a form that meets the needs of both the proponent and the decision-makers.

Outline what is meant by an interdisciplinary team and why it is required in an EIA.

3 Most proposals have a number of potential impacts, often including physical and chemical impacts, biological impacts, and cultural or economic impacts. No one person can be an expert in all of these fields. The multiple viewpoints of the team can often lead to a more reasoned evaluation.

An interdisciplinary team consists of a group of people, trained in different fields, who interact as a group throughout the EIA and produce a coordinated EIA report.

The team is organized to address a common problem and to work together to provide solutions. The members of the team are chosen because they have differing perspectives, technical backgrounds and access to data and analytical techniques.

Putting together the team requires searching for appropriate local consultants, or experienced people from universities and research organizations. Sometimes expertise will have to be obtained from further afield. The team members should be selected for their experience in EIA and their competence in a discipline relating to the proposal. Often, however, the choice of team members is limited to who is available, and what can be afforded. Teams will range in size from two or three to up to thirty members, depending on the complexity of the proposal. In developing countries even large proposals may only have a few specialised staff allocated to the environmental assessment. It should be noted though that small teams are not necessarily less effective or efficient as there can be more continuity within the team, better communications, and more individual responsibility for the success of the assessment.

4 Factors that can affect the selection of team members include:

- finances available;
- range of impacts to be studied;
- demonstrated expertise and experience ;
- demonstrated local knowledge ;
- availability; and
- ability to work with others and contribute to team efforts.

Establishing a team does not in itself guarantee that the EIA will be interdisciplinary. It is the role of the EIA project manager to provide opportunities for the team to meet and work together. The initial site visit is often the first, and most important, chance that team members have to get to meet each other and to learn about the scope of the whole study. Other meetings can be used to review the direction, progress and results of the work and, towards the end of the study, to provide an integrated approach to the writing of the EIA report.

The project manager has the responsibility not only to oversee the production of a complete, factual and easily understood EIA, but also to keep open the lines of communication with all the stakeholders, make sure that information about the proposal and the progress of the impact assessment is readily available and handle conflict and community concerns as they arise.

There will always be conflict for the project manager to manage. Conflict within the team can be either because of disagreement about scientific interpretation, or because team members do not get on with each other. Often proponents will disagree with the assessing team because they do not recognize the significance of some impacts. Other stakeholders may demand information, or attempt to push their individual or group interests, and may oppose findings of the team because they do not understand the basis for these or because they see things in terms of their own interests. The worst conflict of all for the project manager is when the proponent has control of the final review document and may wish to alter it. Some of these conflicts can be avoided by providing readily available information focused at a level which can be understood by the various parties and making sure that the information is communicated to all who need it. Other conflicts within the team and with the proponent are likely to require all the negotiating and communicating skills available to successful project managers.

Ask the participants to identify the attributes that are desirable for members of an interdisciplinary team.

5

To be a successful member of an interdisciplinary team a person should display:

- good team skills;
- creativity;
- adaptability;
- good oral and written communication skills;
- good organizational skills;
- the ability to listen and to assimilate information;
- a good sense of humour; and
- patience.

Introduce the concept of project control through the use of project scheduling. Outline the use of bar charts and critical path methods and ask the participants to suggest any deficiencies these may have. Show participants an examples of a schedule (if available) for a local project.

---

6 Scheduling involves planning how the assessment will be broken down into component activities and how these activities will fit together. It is a crucial step in the project manager's control of the project. To produce a schedule it is necessary to:

- identify key events or dates that control the study;
- break down the project into stages;
- estimate the timing of each of these stages;
- identify the resources required; and
- estimate the cash flow.

The project manager should never underestimate the need to maintain flexibility in the schedule. As the EIA progresses the schedule will need to be constantly updated to reflect what is actually happening.

7 One of the easiest ways to schedule is to prepare a bar chart (sometimes called a Gantt chart) for the project.

More complex, but more powerful, methods of scheduling are the critical path methods (CPM). of which PERT is one commonly used for controlling engineering projects.

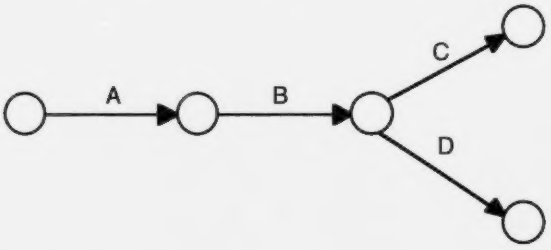
These methods use network logic to construct the network and require the determination of:

- the activities to be performed;
- the events that begin and end each activity; and
- the relationships between activities.

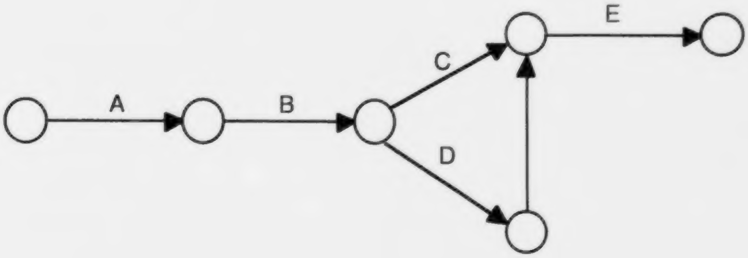
This can be seen in the diagrams below.

8 **Example of Network Logic**

Activity B commences after activity A and before activities C and D



Activity E can commence when activities C and D are complete



Once the network has been established the critical path can be determined. This is the longest path through the network that does not have any slack time. If the duration of an activity on the critical path lengthens, then the duration of the whole project will lengthen.

Introduce and outline the role of budgeting as one of the primary tasks of the project manager.[1]

The most difficult part of budgeting is making the initial estimate on which the request for funding will be made. Early decisions need to be made that identify the most important issues and how they are related to each other. From this can come an estimate of the studies to be made, the people to undertake them, the time required to carry them out, the services required to support the team, the equipment required and the overhead costs.

A budget needs to take account of costs from all possible sources and it should allow for unexpected problems. Items of expenditure can include:

- employed and contracted labour;
- overheads;
- travel and travel allowances;
- vehicle purchase, running and maintenance costs;
- communications;
- computer hardware and software;
- equipment; and
- document production and duplication.

When preparing a budget the project manager may choose to assume that the project costs will be some multiple of the cost of the labour. This multiple usually lies somewhere between 2 and 3 times the labour cost, depending upon various factors such as the rate of profit. (This multiple would not cover very expensive travel or equipment costs.) The costs can then be estimated as shown below.

9

Sample of Part of Budget Preparation[2]

Expertise required	Rate of pay ($ per hour) (a)	Estimated duration of work (hours) (b)	Overhead multiplier (c)	Total (a)x(b)x(c) $
Noise				
1. Investigation				
senior	60	5	2.5	750
junior	15	20	2.5	750
2. Analytical				
senior	60	6	2.5	900
junior	15	40	2.5	1500
3. Reporting				
senior				
junior				
Social impact				
1. Investigation				
Principal				
Senior				
Junior				
2. Analytical				
3. Reporting				

Experienced project managers fight hard for an adequate budget. Where this is not available they make corresponding cuts to the scope, desired accuracy or technical breadth of the planned assessment and have these agreed. Of course, not everything will go to schedule but there are some safeguards which can be put in place to prevent the budget 'blowing out'.

The project manager has to keep tight control to ensure that the team knows exactly what is happening; otherwise the same analysis may be carried out by more than one expert, or analyses may need to be performed more than once because the project components or the scope have been changed.

Even with timelines and a budget in place, there is no guarantee that these will be followed. A major and on-going task of the project manager is to have in place, and use, reporting systems that track expenses and chart progress against the schedule. There are many computer programmes which do this. None of them, however, can replace the need for constant communication with the team members. When decisions are made, everyone needs to know. It is often good policy to put news of important decisions or changes in writing. Progress reports need to be distributed widely. Preferably they should go to the interested public and non-government organizations as well as to the team and to the client.

Briefly outline the project manager's responsibilities in preparing the EIA report (this is covered more fully in Topic 8—*Reporting*). Ask the participants to add to the discussion based on their own experience.[2]

EIA reports are often legal documents, and must comply with the terms of reference. They are also information documents which are used both as the basis of decision-making and as information for all stakeholders in the process. They need to be written, edited, designed and produced to a good and easy-to-read standard. They must also be properly reproduced and distributed, and this requires that money has been set aside in the budget for this purpose. Time for writing, editing, layout and reproduction must be included in the scheduling of the EIA process. Often it is found that more copies need to be printed than is normally budgeted for, particularly if the proposal is in any way controversial.

An early start to the writing the report is a good idea. With the framework in place, adjustments can be made as the assessment progresses. It is better to avoid the trap of too detailed and elaborate descriptions of the existing environment. This material is available early and the temptation is to give it more emphasis than it deserves. The EIA report is about analysing impacts, and this should be the main body of the report. Equally important is the executive summary, as this is what most people read. It must include all significant findings and it is the role of the project manager to decide how this is best done. The project manager must check each detail of the report for consistency and accuracy.

The report will find many critics. Inaccuracies of any sort make it more vulnerable to criticism. Proponents may be tempted to either ignore or hide material they feel is detrimental to their cause. This raises real difficulties for the assessing team, and the best defence for the project manager is to point out that omissions often raise much greater opposition and that they could delay or stop the proposal.

It is also necessary to avoid misleading or meaningless terms. For example, unless the terms severe, adverse, significant, negligible, moderate etc are defined, the report will be read in different ways by different interest groups.

Little is achieved if the final report cannot be successfully communicated. The many audiences of the EIA report all need at some level to have the impacts translated into recognizable quantities. Bingham gives a good example:

> It is not easy to imagine the transport of many millions of cubic yards of earth and rock to build a dam, but it is helpful to state how many trucks of a certain size would be needed during the duration of the construction and the frequency with which these trucks would pass a certain point.[2]

The final days or weeks of report editing and production are a crisis time for most assessment teams. It is extremely valuable to have a competent outsider read and review the report for consistency, accuracy and completeness before it is reproduced and distributed.

Briefly reinforce the capacity building aspects of the role of the project manager.

Before the team disperses it is a useful to have a team 'post mortem' of performance during the project. If this is done systematically then the lessons learned can be used to improve the next EIA. Data collected should be properly formatted and stored for use in future assessments. Lists should be made of all contacts — specialists, institutions and officials — and, if possible, these should be updated from time to time. Reference materials should be properly catalogued and stored. If new equipment has been acquired then decisions should be made as to how this can best be used in future assessments.

These things are particularly important in countries that are moving towards the establishment of EIA processes, as the materials collected, the lessons learnt and the contacts made can all contribute to capacity building and make the role of future project managers less difficult.

Include a training activity to reinforce the topic (if desired)

Conclude by summarizing the presentation and previewing the next topic.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

1. Burack, D. A. (1992) Better Management: The Key to Successful Environmental Impact Assessment (EIA). *12th Annual Meeting and International Congress of the International Association for Impact Assessment*. Washington
2. Bingham, C. S. (1994) EIA and Project Management – A Process of Communication. *CEMP 15th International Seminar on Environmental Assessment and Management*. University of Aberdeen. Aberdeen

OECD/DAC (1994) *Towards Coherence in Environmental Asssessment. Results of the project on Coherence of Environment Assessment for International Bilateral Aid.* Canada

Further reading

Antill, J. M. and Woodhead, R. W. (1970) *Critical Path Methods in Construction Practice*. Wiley Interscience

Ashley, D. B. and Teicholz, M. (1977) Pre-Estimate Cash Flow Analysis. Journal of Construction Division. *Proceedings of the American Society of Engineers* vol 103. no. C03, September

Bisset, R. (1996) *EIA: Issues, Trends and Practice*. Environment and Economics Unit UNEP. Nairobi

Cleland, D. I. and King, W. R. (1983) *Systems Analysis and Project Management*. McGraw Hill International Edition. Auckland

Conover, S. A. M., Strong, K. W., Hickey, T. E. and Sander, F. (1985) An Evolving Framework for Environmental Impact Analysis: 1 Methods. *Journal of Environmental Management*. vol 21. pp. 343-358

Levine, H. A. (1986) *Project Management using Microcomputers*. Osborne McGraw Hill

Mintzberg, H. (1975) The Manager's Job—Folklore and Fact. *Harvard Business Review*, 53(4), pp49-61

Peart, A. J. (1971) *Design of Project Management Systems and Records*. Gower Press

Sadler, B. (1996) *Final Report of International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

12–1 Would the role of the EIA project manager in this country differ significantly from the one outlined in the topic presentation? In what ways? What are the implications of these differences for the EIA process?

12–2 What advantages does using an interdisciplinary team approach bring to EIA?

12–3 What process could be used to select the members of an interdisciplinary team? Where might the required expertise be found?

12–4 How could the work of an interdisciplinary team, contracted to undertake an EIA, be monitored?

12–5 What measures can be put in place to ensure that an EIA team is managed in an interdisciplinary manner?

12–6 Imagine that you are managing an interdisciplinary EIA team and need to select a consultant to be responsible for creating and implementing the public involvement strategy. What features of the consultants who applied for the position would be the most important to you in deciding which one to engage?

Speaker themes

12–1 Arrange for a speaker to discuss the organizational structure of the EIA team used on a local project. Where were people located. How was the team managed to interact in a interdisciplinary manner? What could have been done to improve the management of the team?

Group Activity 12-1: Project management

Title	**Project scheduling**
Aim	To provide experience in task identification, preparing a project schedule and budgeting.
Group size	Four to six people.
Duration	Half-day to one day

Resources required

- Case study containing preliminary EIA information.

Description of activity:

Using a case study:

- identify the major steps in the EIA;
- identify the major tasks to be undertaken including tasks to do with the management of the EIA and the production of the EIA report;
- construct a bar chart to show how the EIA could be scheduled;
- report back to whole group;
- identify the manpower resources required to perform these tasks;
- prepare a staffing schedule;
- estimate the time commitment required by each project member, including meetings, public consultation and review of documentation;
- identify the manpower resources required to perform these tasks;
- estimate other expenses such as travel and EIA report production costs; and
- prepare a budget for the EIA using hourly rates.

Group Activity 12-2: Project management

Title	**Selecting consultants**
Aim	To provide experience in establishing and using criteria for consultant selection.
Group size	Small group activity followed by a large group summing up.
Duration	Half-day

Resources required

☐ Description of a project.

☐ Brief terms of reference.

☐ Three real or invented proposals from consultant teams to carry out the work.

Description of activity:

Using the Terms of Reference and project description:

☐ Develop a set of criteria that could be used to choose between consultant interdisciplinary teams who tender for the work.

☐ From the three proposals from the interdisciplinary teams, use the criteria to select one team.

☐ In a large group discuss how successful the decision criteria were and how could they be improved.

1

A good project manager:
- has solid technical skills
- is action-oriented
- is a team leader
- is able to learn from others
- is a good communicator
- is a good negotiator
- is proficient in planning and budgeting

2

Project manager tasks
- establish the purpose of the EIA
- define tasks and work programmes
- establish and manage the budget
- establish a management structure for the EIA
- set time schedules
- select the interdisciplinary team
- arrange contracts
- set standards for the work
- organize public involvement
- manage information
- produce the EIA report

3

An interdisciplinary team is

a group of people trained in different fields who interact as a group throughout the EIA and produce a co-ordinated report

4

Selection of team members is affected by:
- finances available
- range of impacts to be studied
- expertise and experience
- local knowledge
- availability
- ability to be a good team member

5

Interdisciplinary team members have:
- team skills
- creativity
- adaptability
- communications skills
- organizational skills
- listening skills
- a sense of humour
- patience

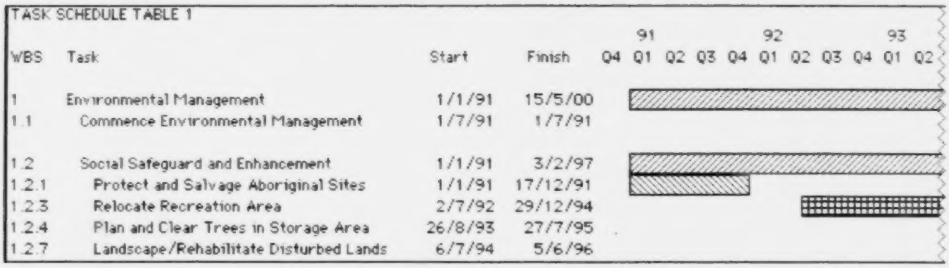
6

Steps in scheduling

- identify key events
- break down project into stages
- estimate timing of stages
- identify resources required
- estimate cash flow

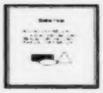
7

Example of simple bar chart



TASK SCHEDULE TABLE 1

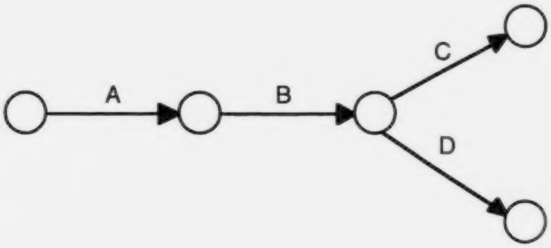
WBS	Task	Start	Finish
1	Environmental Management	1/1/91	15/5/00
1.1	Commence Environmental Management	1/7/91	1/7/91
1.2	Social Safeguard and Enhancement	1/1/91	3/2/97
1.2.1	Protect and Salvage Aboriginal Sites	1/1/91	17/12/91
1.2.3	Relocate Recreation Area	2/7/92	29/12/94
1.2.4	Plan and Clear Trees in Storage Area	26/8/93	27/7/95
1.2.7	Landscape/Rehabilitate Disturbed Lands	6/7/94	5/6/96



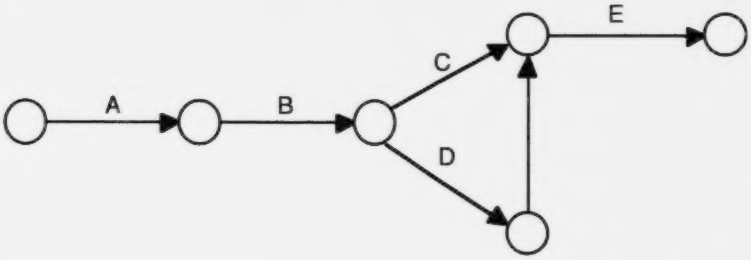
8

Network Logic

Activity B commences after activity A and before activities C and D



Activity E can commence when activities C and D are complete



9

Sample of Part of Budget Preparation

Expertise required	Rate of pay ($ per hour) (a)	Estimated duration of work (hours) (b)	Overhead multiplier (c)	Total (a)x(b)x(c) $
Noise				
1. Investigation				
senior	60	5	2.5	750
junior	15	20	2.5	750
2. Analytical				
senior	60	6	2.5	900
junior	15	40	2.5	1500
3. Reporting				
senior				
junior				
Social impact				
1. Investigation				
Principal				
Senior				
Junior				
2. Analytical				
3. Reporting				

COMPREHENSIVE CHECKLIST FOR MANAGING ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT ASSISTANCE PROJECTS

OECD/DAC (1994) Towards Coherence in Environmental Assessment
(Organized according to the stages in a generalized project cycle)

ASPECTS OF ASSESSMENT	MANAGEMENT ACTIVITIES	EXPLANATORY NOTES
PROJECT IDENTIFICATION STAGE		
Communications	Ensure that potential partners are asked to cooperate in the proposed activity as early as possible in the planning process, particularly before environmental screening occurs.	• This refers to the implementing organization in the recipient country as well as to other donors. • Experience shows early cooperation to be critical to be a successful assessment and project support.
	Establish the time period over which the partners prefer to be involved in the assessment process, particularly in regard to post-completion monitoring and evaluation functions.	• Completion of assessment report often marks the end of collaboration in the assessment process. • There could be prior agreement to collaborate in a mid-term review and/or in project evaluation.
	Maintain and circulate a current list of contact persons in the participating donor agencies and the implementing organization within the recipient country.	• Failure to maintain appropriate contacts can lead to loss of "corporate memory". • Contact persons can change for assessments which extend over a considerable period of time.
	Establish mechanisms whereby officials in the donor agencies and the implementing organization within the recipient country can discuss and jointly plan assessment matters in a timely and effective manner.	• Following the OECD/DAC Good Practices, the recipient country should be encouraged and supported to take the lead, with the involvement of the affected public, in designing, implementing and evaluating the environmental assessment.
Policy Check	Assess the proposed project against the legal requirements, policy objectives and operational priorities of the donor agencies and the recipient country.	• These may be difficult to determine for the recipient country. • It should be determined whether the project has been rejected by any other donors.
	In consultation with recipient country officials, consider the proposed project within the context of national or regional environmental action plans, conservation strategies and state-of-the-environment reports.	• This can include strategic, programmatic or sectoral assessments previously completed by other aid institutions. • OECD/DAC has published Good Practices for Country Environmental Surveys and Strategies.
	Assess the proposed project against the provisions of international agreements to which any of the parties are signatories.	• There are now over 870 bilateral and multilateral international legal instruments that have environmental provisions.
Screening	Ensure that projects are screened for potential environmental impacts in a manner which meets the procedural requirements of the donors and the recipient country.	• Screening is a common occurrence and is required under the OECD/DAC Good Practices. • Not all DAC Members use screening categories; refer to country summary sheets in Volume III.
	Establish procedures for resolving differences in the results of environmental screening, should such occur, in a manner acceptable to all of the parties involved.	• Variation in criteria and procedures can lead to different screening decisions for the same project. • Differences in screening decisions can lead to disagreement on the level of assessment required.

FEASIBILITY STUDY STAGE

Level of Assessment	Ensure that, if screening determines that further assessment is required, the parties agree on the need for a "limited" or "full" assessment.	• The basic steps are the same for limited or full assessment - only the perceived severity of the impacts and the level of analysis is different.
Alternatives	Ensure early consideration of alternatives to the proposed project at the strategic level, i.e., those (i) involving national policy decisions, (ii) having broad-scale socio-economic implications or (iii) impacting on the achievement of long-term sustainable development (includes consideration of the "no go option").	• All parties may not agree on the need to consider alternatives at the strategic level. • Examples include alternative energy sources, transportation modes and agricultural practices. • The need to consider technical alternatives (sites, designs and operating systems) is normally part of the terms of reference for an assessment.
Scoping	Secure agreement from the donors and representatives of the recipient country government on the need for, and objectives of, a scoping process.	• OECD/DAC Good Practices refers to scoping as a process to identify (i) significant environmental issues, (ii) the nature of required analysis and (iii) possible mitigation measures.
	Ensure agreement among all parties on the process of public participation to be followed in the scoping process, including (i) defining "the public", (ii) assigning roles and responsibilities for the process, (iii) informing and contacting affected and interested groups, (iv) recording and analyzing the inputs and (v) distributing results.	• OECD/DAC Good Practices call for the "gathering of data, concerns and expertise" from officials, experts, concerns and expertise" from officials, experts, affected groups and NGOs. • Public participation in developing countries is a sensitive and complex undertaking for which the recipient country must assume responsibility, with support from the donors.
Terms of Reference	Ensure the development of a single terms of reference acceptable to all parties that defines the administrative, procedural, technical and decision-making requirements for the assessment.	• The quality of an environmental assessment will reflect the quality of the terms of reference. • Refer to the Framework Terms of Reference which accompanies this Checklist.
	Determine the roles and responsibilities of the parties in regard to the management and conduct of the environmental assessment.	• OECD/DAC Good Practices encourage recipient countries to take responsibility for their own environmental assessments, with donor support.
	Ensure agreement on procedures for identifying, collecting and storing the required information and data in the recipient country, and for sharing that information and data among the parties.	• Collecting information and data can be one of the most costly aspects of environmental assessment. • Significant savings in cost and time can be achieved through greater sharing of information.
	Take whatever measures are appropriate to maximize the institutional and technical capacity of the recipient country for managing the environmental assessment.	• Capacity building and institutional development in recipient countries is a priority topic for DAC Member countries and improving environmental assessment capability is an important component.
	Ensure procedures for reviewing progress in the environmental assessment, and for reviewing, publishing and distributing the final assessment report in donor and recipient countries.	• Quality control assurance is an important aspect of conducting an environmental assessment. • External review and distribution of assessment reports can be a sensitive issue in some countries.

APPRAISAL STAGE

Project Decision	Ensure that the donors and the recipient country agree on procedures to be followed after the completion of the environmental assessment for arriving at a final decision concerning the acceptance or rejection of the environmental effects of the proposed project.	• OECD Council Recommendation of 1989 provides guidance for high-level decision-makers. • Parties may agree to a collaborative assessment, but they make independent project decisions. • Some donors set time limits from the completion of the assessment to final project decisions.
	Ensure that the donors and the recipient country have come to an agreement on the environmental standards to be applied to the project.	• Donors may reserve the right to have their own standards apply if those of the recipient country are considered unacceptable or not enforceable.
Recommendations	Ensure that recommendations on environmental management plans, mitigation plans, compensation schemes and monitoring programmes are incorporated into project approval documents.	• OECD/DAC has Guidelines for Aid Agencies on Involuntary Displacement and Resettlement. • Financial compensation and replacement of lost land can be politically sensitive issues.
Responsibilities	Ensure clear allocation of responsibilities for the implementation of all recommended actions contained in the environmental assessment report.	• Following OECD/DAC Good Practices, recipient countries should be encouraged and supported to take as much responsibility as possible.

FINAL DESIGN AND IMPLEMENTATION STAGE

Mitigation	Establish procedures to ensure that recommendations on mitigation, monitoring, relocation and compensation are carried out during project design and construction (compliance audit).	• Site monitoring is normally the responsibility of the implementing organisation with the recipient country, with occasional checks by donor resident professionals or consultants.
Reporting	Ensure that reports on the implementation of assessment recommendations are generated on a regular basis and distributed among the parties.	• Careful monitoring of progress at this stage will help to avoid difficult problems in the operational phase of the project.

OPERATIONAL STAGE

Monitoring	Ensure that regular environmental monitoring is conducted in accordance with the recommended monitoring programme, and that procedures are agreed upon in the event that limits are exceeded.	• Objectives are to ensure compliance with standards and to determine success of mitigation. • Monitoring is usually the responsibility of the recipient county with occasional checks by donor.
	Ensure that monitoring records are maintained and verified, and distributed to the participating donors and interested members of the public within the recipient country.	• It may be difficult in some countries to have monitoring equipment maintained and calibrated. • Distribution of monitoring results may be a sensitive issue in some situations.
Mid-term Review	Determine the parties to be involved in a mid-term environmental review, the terms of reference for the review and to whom the results will be distributed.	• Most donor agencies undertake a mid-term review after the project has been in operation for a sufficient period of time for major environmental and social problems to become evident.

MONITORING AND EVALUATION STAGE

Monitoring	Ensure that the recommended environmental monitoring programme has been implemented, determine if it needs to be modified in light of experience, and whether the results are serving a useful purpose.	• Monitoring is costly and time consuming and may become a pro forma exercise. • Experience may show that some variables no longer need to be monitored or that there is no feedback from monitoring to project operations.
Evaluation	Determine which of the parties are interested in participating in an environmental evaluation of the project, when that might occur, and how they might cooperate given that such evaluations are normally undertaken by specialised evaluation units or external independent bodies.	• Comprehensive evaluations are normally undertaken a number of years after project completion. • An evaluation of the environmental aspects of a project is normally part of a much broader based project evaluation.
	Ensure agreement on the scope of the evaluation, i.e., whether or not it will be confined to the original terms of reference.	• Terms of reference provide a good basis upon which to conduct an evaluation, however, they may not have been prepared for some projects.
	Ensure agreement on the publication and distribution of the evaluation reports within the donor and recipient countries.	• There may be disagreement concerning the extent to which evaluation reports should be made available to the general public.
	Based on the evaluation results, prepare a preliminary list of key environmental problems and socio-economic concerns that would likely have to be addressed at the time of eventual project shutdown or decommissioning.	• There is limited but growing experience with environmental cleanup following plant closures. • A specific terms of reference would need to be prepared for environmental cleanup and remediation at time of decommissioning or shutdown.

REFERENCES:

1. OECD (1992). *Development Assistance Committee: Guidelines on Environment and Aid No. 1, Good Practices for Environmental Impact Assessment of Development Projects*, Development Co-operation Directorate, OECD, Paris, 17 pp.

2. OECD (1992). Guidelines on Environment and Aid No. 2, *Good Practices for Country Environmental Surveys and Strategies*, Development Assistance Committee, Paris, 17 pp.

3. Weiss, Edith Brown (ed.) (1992). *Environmental Change and International Law,* United Nations University Press, Tokyo, Japan, 493 pp.

4. OECD (1994). *Towards Coherence in Environmental Assessment, Volume III Summary of Country Policies and Procedures,* Results of the Project on Coherence of Environmental Assessment for International Bilateral Aid, Submitted by Canada to the DAC Working Party on Development Assistance and Environment, April, 1994.

5. OECD (1986). *OECD Council Recommendation concerning an Environmental Checklist for Possible Use by High-Level Decision-Makers in Bilateral and Multilateral Development Assistance Institutions,* OECD, Paris.

6. OECD (1992). *Guidelines on Environment and Aid No. 3, Guidelines for Aid Agencies on Involuntary Displacement and Resettlement in Development Projects,* Development Assistance Committee, Paris, 15 pp.

EIA AND PROJECT MANAGEMENT: A PROCESS OF COMMUNICATION

Charlotte S. Bingham

Presented at the 15th International Seminar on Environmental Assessment and Management CEMP, University of Aberdeen, 26 June–9 July 1994.

INTRODUCTION

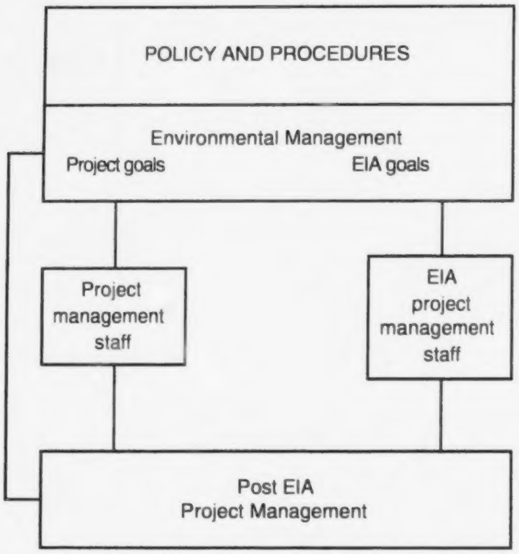
Environmental Impact Assessment: A Process not a Product

The term Environmental Impact Assessment or EIA refers, in this paper, to the environmental impact assessment process. (US readers, please note that this term is used here in its international context and does not refer to Environmental Assessment distinct from Environmental Impact Statement as used in the US to refer to different levels of environmental documentation.) This process can encompass many phases during the evolution of a project and can involve many products, of which only some are EIA documents; other products include meetings, negotiations, public hearings, agreements, permits and other forms of communication. The immediate objective may often be production of an environmental document, but it is important to bear in mind that the goal is not the document.

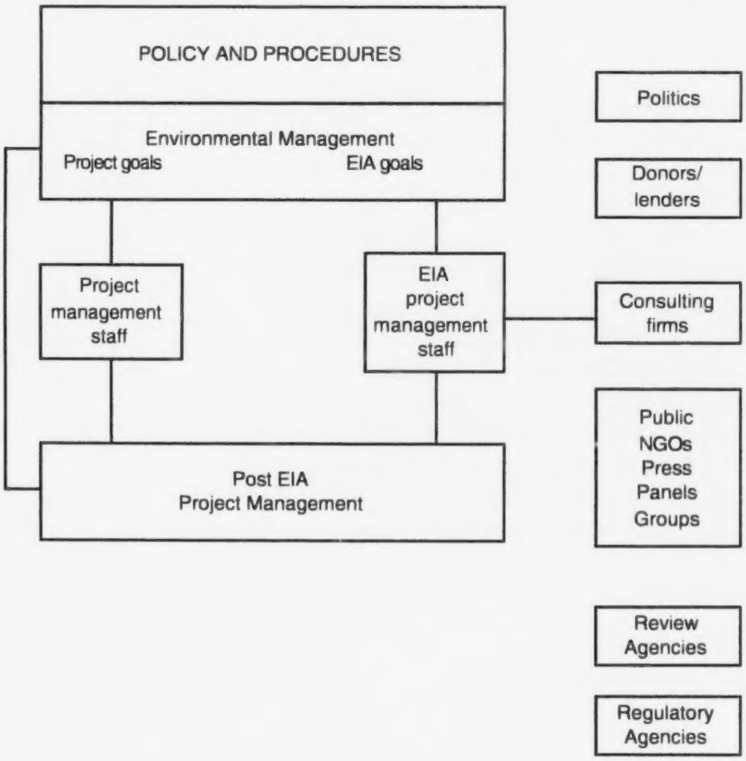
The goal is to achieve management of the environment through the environmental assessment process. If a project manager is to achieve that goal, he or she must look beyond the product he/she is in charge of managing. Reports sit on shelves and memoranda sit in file cabinets. Their utility is only as good as the commitment to action, perhaps inaction, that they generate.

One can sum up the project management of Environmental Impact Assessment in one word. That word is communication. Communication is critical to EIA Project Management, because EIA is a drama with many actors, playing different roles. More accurately, one could characterize it as a series of interwoven dramas each with a set of actors and each with a different message. The EIA Project Manager is in the middle. He or she is answerable to policy-makers and managers above and responsible for staff underneath him.

Because EIA management involves information management, there are many opportunities for mis-communication or misleading communication. (If all else fails, shout.) The following chart shows a simplified version of the EIA Project Manager's role. The chart displays how, in many ways, the EIA process is separate from project planning, design and implementation, even if the two occur in the same agency. Because project goals may not be EIA goals, one must distinguish the EIA Project Manager from the Proponent of the Project and/or Project's Project Manager. They are frequently not the same person and may often be attached to different agencies, different parts of agencies or to independent firms or institutes.


POLICY AND PROCEDURES
Environmental Management
Project goals
EIA goals
Project management staff
EIA project management staff
Post EIA Project Management

The next chart shows a more realistic version of the EIA process. This diagram acknowledges the role of politics, donor agencies, consulting firms, separate review and regulatory agencies, and the publics which include many vested interests, environmental and other non-governmental organizations (NGOs), the press, the academic and scientific community and project neighbours.


POLICY AND PROCEDURES
Environmental Management
Project goals
EIA goals
Project management staff
EIA project management staff
Post EIA Project Management
Politics
Donors/ lenders
Consulting firms
Public
NGOs
Press
Panels
Groups
Review Agencies
Regulatory Agencies

Three Fundamental Aspects of EIA and Project Management

Discussed first are aspects termed Context and Procedure, incorporating the legal, statutory and administrative setting in which the EIA process occurs. The second aspect is Technical Management, the day-to-day and, maybe, year-to-year task of environmental impact assessment. The third aspect is Fiscal Control and Budgets. Resources, defined here as money and time, are always finite; they must be allocated so that an assessment can be as comprehensive as needed and sufficiently focused so that it can be efficiently accomplished.

1. EIA CONTEXT AND PROCEDURE

The first task, and perhaps the most important task of the Project Manager, whether he or she is exclusively the EIA Project Manager or the Project's Project Manager, is to examine and understand his or her role in the context of the project and environmental procedures.

In some situations, such as those in the United States, the context and procedure are very specifically defined, are established in regulations, law or policy and are nearly routine. In places where environmental procedures are younger or elaborated in less detail, there is more opportunity for flexibility and creativity, but EIA procedures can also be more easily put to the side or ignored.

A project manager or a staff person, embarking upon EIA, can benefit from taking the time to answer the following questions:

Why does this project have an EIA process?

When do the EIA components occur?

Who is responsible?

What is the action being examined?

Where are the zones of impact?

These are very simple questions - deceptively simple - as a look at each of these questions will demonstrate.

1.1 Why Do EIA?

What triggers or prompts the need for an Environmental Impact Assessment?

In the US, one is accustomed to having rules or regulations that categorize actions. For example, installing a new traffic light would typically be excluded from environmental assessment. A new roadway would typically require a full and major assessment, called an Environmental Impact Statement. There are others falling in between. such as a major repair or restructuring of a facility, which require an intermediate process of assessment, specifically called an Environmental Assessment. The purpose of this intermediate step is to decide whether the process can end with the Assessment or must go forward to an Environmental Impact Statement. For the latter, the requirements are more rigorous and procedures typically require more public review and involvement. Actions likely to be highly controversial would usually fulfil the definition of an action needing some kind of environmental investigation.

In the absence of regulatory or other procedures that give the Project Manager the answer to why an EIA is needed, the Project Manager must ask: Who decides the need for an EIA? A follow-up question is: Who evaluates or, perhaps, influences the need for an EIA?

Answers will, at the least, provide the Project Manager with some insight into the objectives of his management and may contribute to the rationale for requesting, questioning the need for, or defining the kind of EIA to be undertaken.

Is the EIA proactive or reactive? A reactive EIA is done because one must be done. One does not expect it to change the outcome very much.

For example, imagine a sewage treatment plant, in New York City, whose existence was mandated by the court in order to comply with water quality regulations. A protracted court process ensued about the need for EIA and the level of treatment during a time when interpretation and application of environmental regulations were changing. The site was already chosen and a platform to house it was already built in the river to which effluent would be discharged. The Environmental Assessment became a required formality and not a process of deciding whether, where or how to build the plant. Most options had been foreclosed by prior events.

Consider, on the other hand, a proactive EIA process which becomes the mechanism for intense public debate and detailed analysis. Such was the study of a 30-mile highway through a rapidly developing suburban area outside Washington, DC. The public involvement process for this EIA resulted in: an extra year of study over that anticipated, a map of highway alternatives that looked like a plate of spaghetti, and a detailed examination of every highway segment which could be combined in multiple ways to produce multiple alternatives. Even this very active process of examining alternate routes, however, did not call into serious question a mass transit alternative.

Thus, the Project Manager might ask: in what range or sphere of possible alternatives does this environmental process exist? Or, if he has any decision-making influence, in what range should it exist?

In a country in Southeast Asia, two different examples can be cited. One was an EIA process of a major reservoir scheme; the dams were built and some irrigation had begun. While this ex post facto process might simply have been reactive, in fact it became a creative mechanism to plan mitigation of impacts. The EIA Project Manager, the funding agency for the assessment, and government officials became instrumental in devising mitigation and negotiating the compromises to achieve it. Subsequently, the same actors helped to develop environmental procedures and provided EIA training in order to set the stage for the environmental examination of other projects.

A subsequently proposed reservoir project, subject to these procedures, was evaluated in an Initial Environment Examination, the first step in this country's EIA process. This evaluation resulted in a reduction in reservoir size, principally because of concerns about the numbers of people to be relocated and resettlement opportunities. The moral of this example is that the EIA process, even initial, reconnaissance level environmental examinations, can help to define better projects, both environmentally and otherwise.

What one must not forget is that the environmental process provokes question-asking. Both the questions and the answers can lead to a different focus for a project, perhaps even clarify its purpose and need. The EIA Project Manager serves an important role in asking questions.

1.2 When Does EIA Occur?

The environmental process ideally begins early, as early as pre-feasibility. Thus, a Project Manager may be called upon to initiate or carry out a preliminary step, sometimes referred to as an Environmental Sensitivity Study, an Environmental Constraints Analysis or an Initial Environmental Examination. Whatever the name, its purpose is to identify what the major problems might be and to determine whether they can be resolved at that stage, or whether further environmental analysis is needed.

The stages of environmental analysis are ideally in phase with the project cycle, as indicated below:

- programmatic or generic review of recurring activities or projects, leading to criteria for subsequent EIAs, a generic modification of the project, or even promulgation of regulations; - initial examination during the pre-feasibility phase
- detailed EIA report, incorporating agency review and, sometimes, public review
- mitigation plans of action, accompanying the design phase
- monitoring of mitigation, during construction and implementation
- continued monitoring and evaluation during operation
- re-assessment at decommissioning or abandonment of a project.

This list can serve the project manager in a number of ways.

First, if the EIA Project Manager enters the process in one of the later phases, he can know to look for results or products of the previous processes. Such documents or reviews, if they exist, provide valuable clues about the evolution of a project in terms of environmental constraints and opportunities.

Second, if the EIA Project Manager discovers no previous steps have been taken, then he or she may need to think through what results those steps would have shown, if they had existed. When environmental consciousness enters late, eg. at the design phase, the assessment will help determine the appropriate forms of mitigation and provide the rationale for why they should be performed.

Third, this list can serve as a checklist to the timing of impacts. For example there can be impacts in anticipation of a project. In the US the threat of a major project, such as a nearby highway or a landfill or any use considered undesirable can make it difficult for people to sell properties. Concerns and worries about relocation can be more intense than the actual relocation. In some places, the anticipation of a project may induce people to move to the location, in hopes that they will become project beneficiaries or, if landless, that squatter tenancy will become regularized. As a Project Manager, it is helpful to ask what can happen at each phase and to instruct the staff to do the same. It is typical to emphasize impacts of construction and operation, but it is also a common pitfall to ignore those impacts occurring in the planning and assessment phase or those that occur after the project has served its useful life.

More and more frequently, one finds that the initial phase of the environmental process is important, especially for private enterprises, whose projects do not have the benefit of public sponsorship nor the rights of government to use land and money in the public interest.

Recently, a large waste and refuse firm requested an environmental constraints review of a site they had found for a proposed 200-acre regional landfill. The question the client asked the Project Manager to answer was: Can this project be stopped? After a few days. the answer was yes, for reasons which may seem surprising. The Engineering Project Manager was not happy and the client was not happy, but an EIA Project Manager must be prepared to deliver bad news. The client had chosen as the proposed landfill site an area nearly coincident with the only nationally recognized archaeological district in the state. While the archaeologist needed only a few hours and a map to identify the problem, it took six months to persuade the astonished client that archaeological resources could stop the project. To determine if excavation of artefacts, a common form of mitigation, was acceptable would have required about $1 million and a year of study. Mitigation, if determined to be acceptable, was estimated to cost $2 to 5 million. The Project Managers were requested to solicit the opinion of other nationally known archaeologists and orchestrate a meeting with the responsible state official (State Historic Preservation Officer) in order to convince the corporate decision-maker that buried artefacts could stop a landfill, even if the need for a waste disposal site in the area was urgent.

Some clients seem to be unlucky in choosing sites. The above firm subsequently secured an option to buy another available property and the environmental consultant began the process of reviewing environmental constraints again. This time, potential neighbours and opponents of the project were quick to point out sightings of a threatened bird species. Further investigation and mounting protest was sufficient to stop further consideration of the site. The Project Managers next advised the client to perform a site selection study before choosing property.

It is increasingly common in the US that both public and private institutions perform pre-purchase environmental site evaluations, even before an initial environmental investigation. Typically, the objectives are to determine: 1) whether wetlands are present, since their development is severely regulated in the US; 2) whether endangered species or unique cultural resources might exist; and 3) whether the site has ever been known to be used for industrial purposes or as a dumping site. Existence of toxic wastes or buried waste can not only prevent development of a project, but might make the property owner liable for their clean-up.

1.3 Who is Responsible?

An EIA Project Manager or the overall Manager of a project with an EIA component is one among many responsible actors. Who comprise this list of actors?

Project Proponent or Sponsor of the Action — more than likely this group, especially its Project Manager, wants the project done. That is their mission.

- Proponent's Agent or Consultant
- Regulatory Agency
- Review Agency
- Donor or Lending Agency
- Cooperating and/or commenting agencies
- Recipients of the actions/affected groups

Within each of these categories, there can be an EIA Project Manager, an EIA coordinator, or leader with an interest in EIA. Each agency and each project manager will likely have a different agenda. The project proponent does not want to have environmental impacts. If there are impacts, he wants them to be small and easily mitigated. Proponents fear that the project will be stopped, that studying the impacts will cost time and money or that mitigation will increase project costs. Donor or lending agencies can have these same fears. More and more, however, an environmental examination is part of their agenda.

In contrast, regulatory and environmental review agencies and EIA project managers have another mission - to find, describe and evaluate impacts. When the EIA project manager is attached to the same agency as the proponent, internal battles can ensue. The same conflicts can be mimicked within a consulting firm, when both EIA and design are performed.

Asking the question 'Who am I in the EIA process' will not resolve conflicts, but it will create an awareness of the range of interests and enable appreciation of multiple perspectives. Ascertaining what role one plays in the EIA is more than an exercise in interpersonal dynamics. By seeing multiple perspectives, the Project Manager can better help in negotiating acceptable solutions. The Project Manager can also review the list of actors to ask what each wants and what their rules, jurisdiction. and interests might be. For example:

- environmental guidelines or rules, eg. those followed by a Bank or assistance agency when a donor or lender is involved
- jurisdiction and limits of authority of regulatory agencies, such as coastal zone agencies, forestry departments, or park agencies
- potential concerns of review agencies or other interested parties, such as conservation or environmental groups.

Wherever possible, the EIA Project Manager will establish, through interviews or meetings, some rapport with the actors. Staff can be assigned to do this as well, where particular expertise or knowledge is needed to establish communication. Establishing this communication process can be accomplished at the same time that the Project Manager and his staff gather information about the project or the environment.

1.4 What is the Action? What is the "Pertinent" Environment?

Among the easiest mistakes the EIA Project Manager can make is to concentrate on the characteristics of the existing environment and neglect to pursue detailed knowledge of the proposed action. Without consideration of how the action alters the environment, there is, by definition, no impact assessment.

To accomplish an understanding of the action, the EIA Project Manager must communicate with program developers, project designers, engineers, and whoever else has formulated the action. In addition. the Project Manager might read an introductory text about the project, visit a similar project or otherwise immerse himself in what the project is about. It is through defining the project components that the Project Manager provides critical direction so that he can select appropriate staff experts and so that they can concentrate on how the action might affect the environment.

For example, it is somewhat wasteful and inefficient to have highly specialized air quality or noise experts involved in a reservoir project, whose principal impacts will involve loss of habitat, relocation and changes in aquatic ecology.

1.4.1 Project Components

Knowing all the components of a project at the outset is helpful. Reservoirs may require haul roads, borrow areas at some distance from the site, or intake structures on a river and pipelines to carry water to feed the reservoir. Highways require feeder roads, access points and other interfaces. Every example is different, but the point is obvious: define not just the action, but subsidiary components.

1.4.2 Alternatives

The definition of alternatives is another important component of answering the question: what is the action? There are varieties of alternatives: site alternatives, process alternatives, or structural versus non structural alternatives. For example, a reservoir may have alternative sizes, configurations and locations. Depending upon the purpose of the reservoir, there may be alternative ways to accomplish flood control, supply power, or provide irrigation water, none of which requires a reservoir.

Consideration of alternatives is, in US regulations, "the heart" of the environmental process. The purpose of alternatives flows back to purpose and need: what should be done and how can it be accomplished?

The EIA Project Manager can sometimes participate in defining alternatives with project designers or engineers. More frequently, he can refine alternatives to achieve impact avoidance or mitigation. Rarely are all alternatives treated equally. All too often the project is viewed as the end or the purpose and not as the means to some purpose.

1.4.3 Scoping and Defining Issues

As a corollary to understanding the action and its alternatives, the EIA Project Manager needs to identify the sensitive or critical aspects of the affected environment. Highly erodible soils or a high water table may merit more attention for some projects than others. An environmental or natural resources inventory or atlas can provide valuable information regarding sensitive or critical areas and so can conservation groups, extension agents, and those who live and work in the affected environment.

What is important to the public deserves attention. A note of caution is in order, however. A public concern is not always a major impact from an analytical perspective. How closely public perception coincides with scientific judgment depends in part on the public's knowledge. In the example noted earlier about how an archaeological district stopped a landfill, the public was virtually unaware of the issue. In the case of the second example regarding the landfill site, the public's perception of threatened bird habitat provoked considerable investigation, but there was no clear indication that the species would have been affected.

Scoping is the formal procedure for involving others in a project, gaining their perspective about how a project could alter the environment and hearing their ideas about topics most in need of study. Scoping can be accomplished by communicating, through meetings with other agencies and the public. Scoping is much talked about as a process to focus the range of studies; in the US it can just as easily expand rather than narrow the range of topics to be addressed. Perhaps, this outcome arises because the US process of environmental assessment is so moulded and influenced by litigation. One dare not leave a topic untouched, lest one be sued for not having been comprehensive or not having made what the court might find to be a reasonable attempt.

The EIA Project Manager's role is to establish the assessment framework: communicate the project description and communicate the appropriate focus on environmental issues. It is only the Project Manager's fault, should staff members each assess a different variation of the project, because the Project Manager forgot to inform them that a project component had changed. Defining a changing project is a challenge. Yet, at the core of the assessment lies the accurate and complete definition of the project.

1.5 Where are the Zones of Impact?

Establishing the zone of impact, ie. the geographic study area, is the Project Manager's responsibility. The simplest approach is to make a chart of the following type:

- List all the geographic zones from the globe or world to the site's property boundaries or subcomponents of that, if the site is large.
- Consider the phases of the project from planning through decommissioning and ask: what could the project do to the environment at each geographic scale?

- Repeat the process by considering all the facets of the environment and ask: could something happen to air, climate, geology, wildlife, etc. at each geographic scale?
- Repeat the process for each project alternative.

With regard to 'geography,' two points are especially relevant: different alternatives can affect different geographic areas; and different types of impact categories vary in geographic extent. An assessment of visual impacts, for example, is typically limited to what can be seen. Even this simple example can require a little more thought: seen when (at night or day) and seen where (with ordinary eyesight, with binoculars, from the air)? An industrial facility viewed from a tourist location or an historic monument may require more attention than meets the eye. Clearly an underground structural alternative is different from an exposed above ground alternative and different from an above ground alternative enclosed by a structure. The range or extent of economic and social impacts requires attention to a regional economic framework. The range of wildlife impacts depends upon the range of the species as well as the project components. Traffic impacts have a geographic extent dependent upon the traffic network, and so on.

A common mistake that the environmental expert makes is to concentrate too much on the site of the activity itself and not on the surroundings. Again, it is the Project Manager's task to determine appropriate geographic study areas. As a practical matter, the Project Manager needs to make these study areas common to as many disciplines as is reasonable. Not only does one achieve efficiency, one avoids confusion among the staff. When it is time to present the findings, one can present a limited set of study areas that represent the reasonable extent or geographic range of impact for each topic, but hopefully not a different study area for every topic

1.6 The Importance of the Five Questions

The five essential project manager questions are: why, when, who, what (what environment/what project) and where. Answering each of these questions is critical to a selection of analytical procedures and methods.

If one can tackle each of these questions at the outset, the technical aspects of project management are easier. By answering the why, when, who, what and where and sharing the results with staff, one can focus the technical work on the subjects and areas of relevance.

2. TECHNICAL MANAGEMENT

The previous discussion of context and procedure is deceptively simple, but fraught with decisions affecting the outcome of the EIA. Consider the following: Do not be an EIA Project Manager if you are prone to ulcers, suffer from insomnia, or can not abide tension and conflict. Tension, conflict, negotiation, smiling when you are abused, and changing directions when needed are part of the job.

This part of the discussion considers five aspects of technical project management. These are:

- Multi-disciplinary Team Coordination (and control)
- Scheduling and Establishing Priorities
- Keeping Track of Project Evolution and Change
- Resolving Conflicts
- Reporting or Communicating Findings

In all of these, the Project Manager must be prepared to be humble, to admit when he is wrong and to be relentless when he has the opportunity to be right. (Notice the phrase is not 'when one is right,' but 'when one has the opportunity to be right.')

2.1 Multi-Disciplinary Team

Choosing the team to work on an EIA is desirable, but often choices are a matter of who is available, who can be afforded and the number of people who can be chosen or assigned within the budget.

Division of labor and team size go hand in hand. A very large EIA effort can involve from 15 to 30 persons, each with a different expertise, level of responsibility, and time commitment. The larger the budget, the bigger the project, the more experts the team can have. A large multi-disciplinary team of the size 15 to 30 will benefit from the appointment of deputy or assistant project managers, eg., a deputy manager for the physical environment, another for the human environment and a third for the biological environment. Divisions of labor can become more specialized, with separate teams for hazardous waste/toxic assessment, cultural resources, and public participation and community liaison.

Sometimes, the EIA budget can only afford one to three people. In this instance, one or more of the three must be EIA veterans. Overall management of a project when rules, procedures and techniques are formally established, as they frequently are in developed countries, versus situations where formal procedures are less defined does not differ greatly. With respect to staffing availability, however, there can be major differences. Unique or mega-projects in developing countries tend to have fewer specialized staff available than some routine projects in the US. Developing countries often have no obligation to follow a particular methodology or to use an agency-specified air quality model, water quality model, habitat assessment technique, or the like. While this may mean more flexibility, it also means that the staff must spend time selecting or developing the method of analysis. In addition there are fewer standard products for baseline data available, so proportionally more effort must be directed to obtaining baseline data. Thus, EIA staff in developing countries face more arduous challenges.

These statements should not be construed as suggesting that EIA results are superior in developed countries. There is more precision, but not necessarily more accuracy of prediction. There is also more analysis of marginal issues and less opportunity for creativity in method and analysis. More attention in US projects is given to the impacts on hundreds of people than to thousands elsewhere, but this attention does not necessarily track back to better environmental management. Beware of being precisely correct but generally wrong, eg. carrying out an analysis to decimal points, when assumptions required for that analysis do not justify such precision or when the assumptions are indeed, subject to question.

With respect to the type of specializations chosen, the desired specialties and levels of expertise will be clear, if the EIA Project Manager has clearly defined what the project is and what the sensitive aspects of the environment are. If the team is small, it is helpful to include an ecologist or other biological scientist, an engineer or a physical scientist and a social scientist, one of which must be the project manager. When the team is small, it is also useful to plan that each staff member can consult with someone more specialized. Small doses of consulting from specialized experts can be extremely valuable. An elephant (lion, lemur, rat, etc.) expert may be needed only briefly to assist in clarifying an ecological evaluation.

One might believe that it is better to convene a large group of short-term specialists to gain the most highly specialized expertise in every discipline. There are several reasons why one should not adopt this approach: staff need to have continuity within the team: the project manager needs staff who are responsible over the long term. The project manager must essentially teach and communicate to every member of the team the ground rules the "who-what-when-why-where" discussed earlier. Communication becomes unwieldy with a large group of short-term experts. In developing countries, this approach has another drawback. One goal is to develop an expertise and a familiarity with the environmental process. Exposure and commitment from inception to final product are part of the training.

Communication among discipline specialists, even when they are part of the same EIA team, is not always smooth. Each specialist becomes an advocate for the part of the environment that he or she is studying. This circumstance is healthy, because it promotes debate and interaction. The social scientist or community planner will easily tend to advocate a position or an alternative that least affects the population and cultural groups he has grown to know well. The ecologist will favour a position and a project arrangement that least affects a natural habitat. When site alternatives are being compared, the most populated site often has less favoured habitat, while the site with the better habitat has fewer affected people.

The EIA Project Manager's job is to keep debates in perspective. He can do this by drawing attention to indirect impacts and linkages among impacts. Advocacy positions tend to oversimplify and do not reflect the blurred and conflicting societal choices that are at the heart of project issues.

Respect for technical judgments is essential. No matter how good the Project Manager may be, he cannot simultaneously be an expert in all disciplines. His dilemma is to have sufficient humility to realize that he must trust the staff and simultaneously have the boldness to challenge them. His goal is to synthesize without diluting technical conclusions and to display and contrast objectively the differences among impacts.

Control of a multi-disciplinary team means control among peers. All are professionals; all must be presumed competent, at least until proved otherwise. The purpose of control is not control over people or the technical conclusions. Effective control is neither authoritarian nor bureaucratic. How, then, can an EIA Project Manager control a process, based on collections of expert knowledge and sets of predictions?

- Focus on impacts and goal-directed research.
- Establish the sets of project assumptions, ie. what is the definition of the action and keep these up to date.
- Insist on a common framework of explanation and presentation, eg. write the report outlines and meeting agenda, establish common terminology (study area, study corridor, etc).
- Communicate with the team individually and as a whole.
- Insist upon and perform exacting quality control (read everything carefully and critically).

Working with a multi-disciplinary team to produce an interdisciplinary document is rather like being a traffic cop in the midst of rush hour traffic and directing the traffic so that everyone behaves rationally, follows regulations, and arrives at the destination on time.

2.2 Schedules and Priorities

While an EIA process may last for years, each specific product associated with a project phase, a project decision or a permit has deadlines. Projects lasting the longest can still have the most severe deadlines and the tightest schedules, as each phase can become a strict and tight crunch in order to move to the next phase. For example, an Environmental Impact

Statement was needed to meet a national funding deadline and had to be produced within one year, including a mandatory public review period. There were many sleepless nights prior to producing the document and after, when 1100 comments on this controversial project had to be answered within one month.

The relative importance of particular issues to the project helps set priorities for the acquisition of background information and descriptions of the affected environment. Once focused studies of existing conditions can proceed independently, more or less. Impact analyses, however, are dependent often on each other and always on the definition of project activities. The necessity of defining the nature and components of the project has been stressed earlier.

Linkages among impacts present another source of scheduling problems. Predicting air quality and noise impacts, for example, requires modeling, which in turn, requires projected traffic volumes and speeds, which, in turn, require estimation of project employment or population movement and scenarios regarding construction and implementation. In certain countries, emission rates from cars and trucks are relatively standard data, but such rates must often be developed in countries where regulations requiring automobiles and trucks to meet certain standards are absent.

Evaluating impacts on species composition and abundance of fish or other aquatic organisms requires predictions about water quality, which, in turn, can depend upon alterations in hydrology, which, in turn, depends upon how a project changes the volume or biochemical characteristics of a water source.

Without belaboring the obvious proposition that ecological relationships are linked and interdependent, this well-understood concept of science needs to be reflected in the mundane schedule of project studies. For each project, it is the Project Manager's task to figure out how impacts are linked and to schedule these tasks so that inputs from one task to another are ready in time. One can easily engage staff members in this exercise. The staff member responsible for the last link bears the brunt of everyone else's delays and will readily share these problems with the EIA Project Manager, once forewarned. The person producing graphics or maps is often the last link and the first link, as all team members need project and area maps to do research and many results require graphic display. A wise Project Manager will schedule the first link in a series of interdependent impacts early and presume that delays will occur.

An equally challenging task is to schedule ecological sampling, which may need to cover seasons, and other longitudinal sampling. Many US environmental studies require four-season sampling in order to obtain information that might otherwise be missed. Some monitoring studies, which are the conditions of permits, persist for years. In contrast, an external (often political and/or practical) decision about deadlines for an environmental document and a project decision may not have considered relevant sampling periods. In this case, impact analysis may need to overlap with the actual gathering of data, such that data is gathered and analyzed in increments. Such an approach can actually be helpful, because it may assist in refining the data gathering program.

There are other worse scheduling situations no time to gather project-specific data within the project time schedule. This situation is tricky, because it requires utilizing available data and/or reconnaissance level generalities in order to arrive at conclusions that, in this case, are informed judgments, which may not hold up under scrutiny. All parties to this kind of investigation need to be aware of the potential risks of proceeding in a manner that meets the deadline, but may not be adequate analysis.

An EIA Project Manager needs, at the very least, a calendar bar chart, which shows when each component of an environmental study will be accomplished. As a general rule of thumb, every task, whether it be the study of terrestrial ecology, traffic or a community, requires time to:

- review the literature
- perform a reconnaissance
- refine a data gathering approach and method
- execute data gathering
- analyze data
- predict impacts
- recommend mitigation measures, and
- communicate all of the above in writing and often in meeting

Part of the EIA managerial task is to allocate priorities to significant issues, both those which are sensitive, such as land tenure and relocation rights, and regulatory requirements.

When various agencies require permits, each will have its own timetable, and the Project Manager must consider the timetables of those other actors, another good reason for clarifying the roles of the actors in the very beginning of the process.

2.3 Project Evolution and Change

The fact that projects change during the process of environmental impact assessment is both a delight and a difficulty. Project changes can be initiated by the Project Manager or his staff in order to avoid or lessen impacts; such is laudable within the context of EIA goals. Changes can also be unwelcome, when they are a surprise or when they seem to be an unnecessary whim of a project designer or reviewer. These are the kinds of changes the Project Manager learns to expect and must confront:

- Altered Concept or Design
- Different Location or Geographic Scope
- New Regulations
- New Staff or Managers with New Project Concepts
- Environmental Changes

Any of these changes requires communication with the staff and communication with those responsible for the change. Most of the types of changes noted above are self-explanatory. The EIA Project Manager can resist them when they may engender a higher magnitude of impacts and he may encourage reconsideration of any change in project definition. Mostly, however, the EIA Project Manager does not define the project and must account for changes by redoing the environmental analysis.

Among the more unusual changes to be faced is environmental change occurring so dramatically during the EIA process that assessment of impacts cannot keep pace. For example, route alternatives for a major highway in a rapidly suburbanizing area outside Washington, DC, had been established with great difficulty, because vacant land became housing developments, seemingly overnight. This situation made it difficult to assess impacts, except instantaneously. Yet without a document, there could be no public hearing, no evaluation of alternatives, and no decision, but any document would, by definition, not be accurate with respect to how the built environment (sensitive noise receptors, relocated homes and businesses, road network) would be affected. For this project, the practical decision made by the EIA Project Manager and the Highway Department Project Manager was to freeze the design and analysis of environmental conditions as of a certain date. The environmental document stated that conditions had been analyzed as of March; it went on to say that areas being developed had been recognized as potential sources of impacts, but that numbers of households to be relocated, numbers of dwellings subject to noise impacts and the like had not been counted after the specified date. In addition, this document, sent out for review and public comment, stated that the final document. which presented a chosen route would be revised to account for all impacts that had occurred because of new development during the interim. Inherent in this way of coping with a situation of rapid change was the assumption that the rapidly changing situation affected all alternatives equally and that such change would not, therefore, be a decision-making factor. In this particular case, the assumption was fair and a practical choice, but such a choice is not always available. In that case, one must predict the range of different impacts under different projected futures.

The EIA Project Manager will generally expect project evolution and learn to welcome revisions. They become opportunities to revise and thus improve the project and to mitigate impacts. As change is inevitable it is useful to adopt mechanisms for dealing with it, especially when one is predicting impacts of alternative changes.

2.4 Resolving Conflicts

Conflict resolution occupies much of an EIA Project Manager's time. Conflicts can arise in many ways, of which the following are only illustrative:

- Staff battles ranging from honest scientific disagreement to personality conflict.
- Designers/proponents arguing with impact assessors, because it is not uncommon for proponents to believe that impacts will not occur or are insignificant. When the proponent controls the document and may alter it to suit his vested interest, definite danger lies a head.
- Differing agency agendas and guidelines often presenting conflicts with each other.
- Differing opinions existing among specialists, eg., review specialists, who have not have had the same opportunity to know the project as intimately as the primary staff.
- Public interests varying in intensity, level of information and skill, and objectives, but all demanding attention from a sympathetic listener and a portrayal of impacts specific to their interests.

The public participation process and the art of conflict resolution have been the subject of numerous articles in such journals as the Environmental Impact Assessment Review (MIT Centre for Technology, Policy and Industrial Development, published by Elsevier) and the Environmental Professional (National Association of Environmental Professionals).

2.5 Reporting and Communicating Findings

All of the other aspects of project management may proceed successfully, but without effective reporting and communication of findings, little will have been achieved. The Project Manager faces his hardest challenge in coordinating and synthesizing the results of a multi-disciplinary staff into an interdisciplinary impact assessment. Once having achieved a consistent document internally, one is better able to face external questions.

The Project Manager must be attentive to the multiple demands of the audience. This audience consists of scientific peers, politicians, and the public. The scientific peer will subject a document or coordination meeting to scientific scrutiny. Providing technical data and computations to satisfy this audience is best served by a technical appendix. The politician or decision-maker, on the other hand, looks to find the basis for a decision or an opinion that is supported by appropriate data and is defensible. Public reviewers and commentators above all do not want to be confused by jargon or unintelligible language, as they may wonder if such is intended to obfuscate or hide the facts, even when that is not the intent.

Translating impacts into recognizable quantities is especially helpful to all audiences. For example, it is not easy to imagine the transport of many million cubic yards of earth or rock to build a dam, but it is helpful to state how many trucks of a certain size would be needed over the duration of construction and the frequency with which these trucks would pass a certain point. Facts are facts, but they can wear many guises. The point is to convey them in a way that is meaningful.

Factual accuracy is, indeed, not a luxury. It is essential.

The possibility exists that proponents, reviewers and bosses may tone down or even omit impacts from a document. EIA Project Managers have an obligation to prevent this, even though they may receive pressure to do otherwise. One technique is to suggest that reviewers, including the public, will ask about the issue anyway and it is better to acknowledge the situation directly rather than to hide it and risk accusations of deceit. The next line of argument is to suggest, in places where there is litigation over application and adequacy of environmental documents, that to omit information purposely can result in successful litigation, which will only delay and potentially through delay, stop a project. If the message needs to be delivered more strongly, the EIA Project Manager can suggest that records of all suggestions for changing documents are made and that originally submitted documents are kept on file. If all else fails, one can suggest to close friends in environmental groups that a particular document merits scrutiny in certain parts.

Factual accuracy is typically threatened more subtly by sloppy communication rather than by outright attempts to deceive or soften impacts. It is easy to refer to impacts as severe, adverse, significant, important, negligible, moderately adverse or minimal. Without a pre-defined standard of measurement for such terms, they are meaningless and misleading. This author has reviewed impact assessments and struck out every adjective other than factually descriptive ones, such as those describing color, quantity, size or direction.

Such an exercise is useful. It reveals the need for establishing criteria of judgment and establishes the need for sending various analyses back for re-writes, re-analysis, or reconceptualization.

Consistency among impact analyses and descriptions of the environment would seem relatively easy to achieve, if the EIA Project Manager has followed the previous advice about defining the project and keeping the staff up to date on project changes. That procedure helps, but it provides no guarantee that staff may not simply forget to change the numbers in their computer input or blissfully ignore the relevance of the project change to their analysis. The EIA Project Manager's task is to review and check every analysis for consistency regarding project components and location and for internal consistency.

Focus is another essential objective. Although impact analysis is the desired outcome, many EIAs suffer from elaborate descriptions of the existing environment, often double or triple in length the space devoted to the analysis of impacts. The EIA Project Manager must remind the staff that the assessment report is neither a travel guide, nor a field guide nor an encyclopedia. It is the EIA Project Manager's task to decide what descriptive material can be referenced and what can be placed in Appendices and to direct the attention of staff to what matters.

Achieving clarity requires that one person, usually the EIA Project Manager, review an EIA document for clarity, consistency and factual accuracy all essential ingredients of a quality control process that was established at the beginning of the study. Diagrams, photos, maps and other visual representations are valuable aids to assist in the portrayal of the analysis.

The summary of any document deserves the most attention, because it is the part most people read. Here too, visual devices, such as matrices, which display and compare impacts are helpful. As a test of what most people read, include a nonsense remark in the text. One colleague of this author routinely included a description of a man-eating fish, named after his former girl friend, in all internal drafts and review drafts. Sometimes no one ever noticed. Should the document misspell the name of a local street, however, one can be certain that everyone who lives on or near it will assume that the entire document is fallacious. While focus is essential, attention to such detail is equally important if the document is to be deemed credible.

On a more serious note, the summary of any lengthy or elaborate analysis must not omit findings. Choosing what to include and what to exclude is a serious decision, since conclusions later found to be in the document but not reported in the summary suggest a breach of ethics. Reviewers of documents are advised to make such a comparison by looking for what is not stated.

At the time of any report preparation, the EIA Project Manager must be ready for what can be termed the nightmare of the numbers. No matter what attention and care the Manager has exercised, he may find that every analyst used a different, even slightly different number, as the basis for an analysis. The key to avoiding this dilemma is to issue a project description with numbers describing project quantities to be used by all as their starting point. Even so, the numbers tend to be inconsistent and must be reconciled.

3. FISCAL CONTROL AND BUDGETS

The ingredients are simple: resources, defined as staff and budget, over time. Allocating these resources over time, once the dimensions and requirements of the project are roughly known, is accomplished by deciding what issues are important and how impacts are linked to each other. The more difficult task is to make these allocations initially in order to request or propose the sum of resources and the time needed. The proposed estimate should detail what services, what studies, what equipment and the like are included and what possible services are not included. Consulting firms make educated guesses - guesses as to what other consultants will say a project costs, guesses as to what the proponent has available to pay. One protects these guesses by specifying what they cover.

Efficiency is achieved by not wasting time and resources on fruitless endeavours and by accomplishing a task properly the first time (quality management and control). Among the worst wastes of time and money is performing analyses more than once, because no one was attentive to how project components, numbers, or geographic scope changed. Another waste of resources, common in large projects when many people are involved with specialties that are closely related, is to find that analysis has been done twice by two different specialists. Worse yet, the answers may be different. The EIA Project Manager's assignment of tasks needs to consider where disciplinary edges converge. For large projects, one avoids the dilemma by assigning deputy managers to head a team of closely allied disciplines. In smaller projects, one hopes to establish close and prompt communication.

Once a budget and timetable are established, the EIA Project Manager must not assume that they will be followed. In fact, he should assume that they will not be followed — hence, the need to have a mechanism for reporting expenditures and time utilized. There are a variety of graphs, charts and computerized techniques to track expenses, to assist in comparing percent of task completion with percent of task budget expended, and to chart actual progress against scheduled progress. These procedures are not unique to EIA and will not be further discussed here. The many spreadsheet programs and techniques, however, only provide a way of tracking information. They do not communicate it to others; they do not make judgments regarding priorities and allocations.

Once reporting procedures are in place, the EIA Project Manager needs to monitor the use of resources, weekly or monthly, depending upon the size of the budget and the rate of spending. Projects have a nasty tendency to show low levels of expenditures at the beginning and then build to a high peak. It is in the last weeks or months of a project that unanticipated expenditures seem to occur, particularly if report production is underway.

Planning for contingencies and the inevitable crunch at the scheduled time for completion is the best protection. Set aside resources that are not allocated to the staff. Rather than telling staff they have three calendar months and two months of salary time to complete a project, tell them they have less.

Changes and unforeseen consequences do arise, even with excellent budgeting, reporting and monitoring. Perhaps, a site reconnaissance results in detection of the possibility of a rare and endangered species. More rigorous sampling methods would be needed. Perhaps, the project configuration changes. When unforeseen events occur, the EIA Project Manager is advised to document their occurrence, estimate the costs of pursuing additional studies and request more budget and/or time. On these occasions, the details of the original budget estimate are critical. An estimate that states what is to be done or what amount of time and money and that makes clear what is not included will support the request for additional resources.

CONCLUSION

This paper has discussed the EIA context, its technical management and its fiscal management as three key aspects of EIA project management. They do not, however, tell all the story. A project manager's first EIA process is exciting and novel. One can learn from it by keeping records as it proceeds or by consciously recalling the lessons it has provided. Then one should plan what one would have done differently. Nevertheless a frequently overlooked aspect of EIA project management is the post-mortem, or after-the-fact look with the staff to consider if manager or staff might have approached the process or its tasks differently. Then and there is the time to prepare for the next EIA. The process proceeds best by building upon a foundation and subsequently modifying it as a result of having identified problems and determined ways to rectify them.

It is also important to consider EIAs as building blocks of data, ie., set a goal so that data collected in one EIA provides a stepping stone to the next EIA. For example, an EIA concerning a congested central district might offer an opportunity to establish a data base on air quality, a topic likely to be of continuing significance in a growing metropolitan area. In an agricultural district, an EIA might collect data on soils or groundwater, which becomes the nucleus of a data base to be maintained and updated for future use. A list of institutions, such as non-governmental organizations, developed for one EIA can become a useful mailing list to maintain future or continuing communication.

The EIA process also requires that one build foundations in the metaphorical sense. These foundations are especially important to developing nations. One may promote EIA as the means to acquire environmental training should such a project be funded by a lending or donor institution. Training of this type is likely to attain support. One may become allies with environmental groups, with an academic or research institution, or with consulting firms. Such partnerships within a country or region and between members of developed and developing nations will be of interest to both.

Some projects may lend themselves to acquiring new equipment, such as a Geographic Information System, which can subsequently be used to build a geographic data base. Others might be used to acquire documents. One must be alert to how one can use the project to provide enhanced possibilities for subsequent projects.

As one acquires experience with EIA, one might write guidelines to procedure, methods, or project management so that an environmental, institutional history is saved. The EIA Project Manager can leave a legacy. Others can add to it and refine it. To view EIA project management not solely in project terms, but in the institutional and historical context, is to view project management appropriately.

A good project manager:

- has solid technical skills
- is action-oriented
- is a team leader
- is able to learn from others
- is a good communicator
- is a good negotiator
- is proficient in planning and budgeting

Project manager tasks:

- establish the purpose of the EIA
- define tasks and work programs
- establish and manage the budget
- establish a management structure for the EIA
- set time schedules
- select the interdisciplinary team
- arrange contracts
- set standards for the work
- organise public involvement
- manage information
- produce the EIA report

An interdisciplinary team is

a group of people trained in different fields who interact as a group throughout the EIA and produce a co-ordinated report

Selection of team members is affected by:

- finances available
- range of impacts to be studied
- expertise and experience
- local knowledge
- availability
- ability to be a good team member

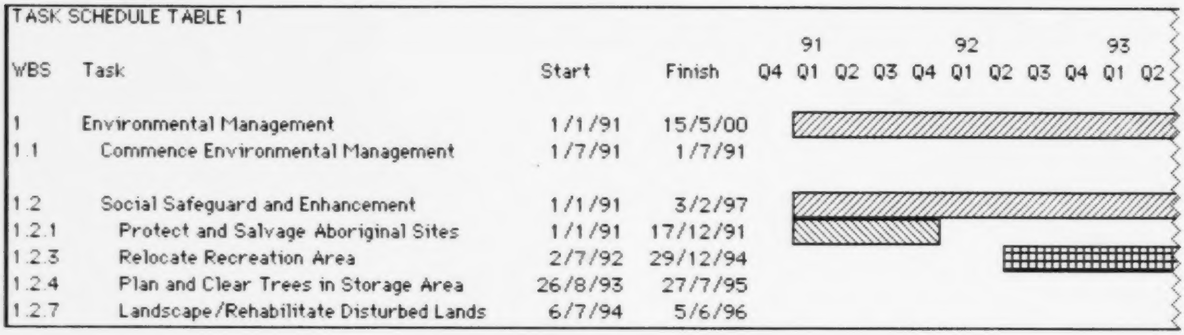
Interdisciplinary team members have:

- team skills
- creativity
- adaptability
- communications skills
- organisational skills
- listening skills
- a sense of humour
- patience

Steps in scheduling

- identify key events
- break down project into stages
- estimate timing of stages
- identify resources required
- estimate cash flow

Example of a simple bar chart

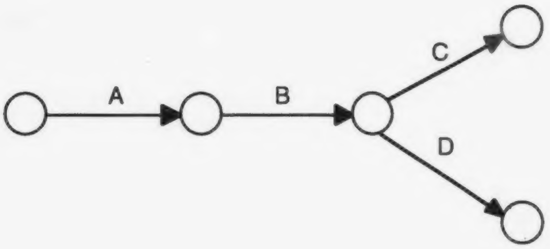


TASK SCHEDULE TABLE 1

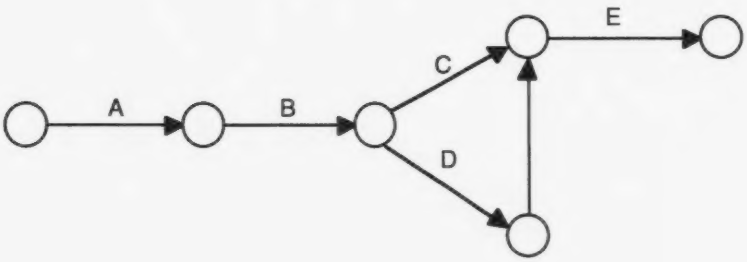
WBS	Task	Start	Finish
1	Environmental Management	1/1/91	15/5/00
1.1	Commence Environmental Management	1/7/91	1/7/91
1.2	Social Safeguard and Enhancement	1/1/91	3/2/97
1.2.1	Protect and Salvage Aboriginal Sites	1/1/91	17/12/91
1.2.3	Relocate Recreation Area	2/7/92	29/12/94
1.2.4	Plan and Clear Trees in Storage Area	26/8/93	27/7/95
1.2.7	Landscape/Rehabilitate Disturbed Lands	6/7/94	5/6/96

Network Logic

Activity B commences after activity A and before activities C and D



Activity E can commence when activities C and D are complete



Sample of part of a budget preparation

Expertise required	Rate of pay ($ per hour) (a)	Estimated duration of work (hours) (b)	Overhead multiplier (c)	Total (a)x(b)x(c) $
Noise				
1. Investigation				
senior	60	5	2.5	750
junior	15	20	2.5	750
2. Analytical				
senior	60	6	2.5	900
junior	15	40	2.5	1500
3. Reporting				
senior				
junior				
Social impact				
1. Investigation				
Principal				
Senior				
Junior				
2. Analytical				
3. Reporting				

Topic 13—Future Directions

Objective

To place environmental impact assessment into a broader context and make participants aware that EIA, along with other environmental management tools, is evolving as a tool for sustainability.

Relevance

The approach of this manual has been to take the participants step by step through the requirements for effective project EIA. Project EIA, however, is only one of many environmental management tools and the emphasis in the future should be on a more integrative approach to environmental management and planning.

Timing

One hour

☑ Information checklist

Obtain or develop the following , as appropriate:

- ☐ examples of ways in which the local EIA system has been developed, or has evolved, to better meet the needs of sustainability;
- ☐ examples of the use of other environmental management tools such as strategic environmental assessment;
- ☐ contact names and telephone numbers of people, agencies, organisations and environmental information/data resource centres that may be able to provide assistance in relation to the changing nature of environmental management tools; and
- ☐ other resources that may be available such videos, journal articles, andcase studies

Session Outline

In concluding, place EIA into a broader context. Emphasise the importance of developing a more integrative approach to future EIA and note the responsibility that we all have to use, and improve, EIA as an integrated sustainability tool.

The training presented in this manual has focused on the well established and tested process for the planning and management of proposals – environmental impact assessment. The emphasis on EIA is a reflection of the common agreement that current appraisal tools offer a secure foundation on which to base sustainable development. As Ron Bisset has noted in the companion volume *EIA: Issues, Trends and Practice,* in global terms EIA is the tool which has the most widespread use, is usually required by law, and whose results are usually publicly available...'No other tool has this status, nor are any likely to achieve it in the near future.'

The foreword to this Manual notes that environmental impact assessment promotes several of the key requirements for sustainable development. It is:

1

- *a foundation tool* – providing a sound basis for institutional development;
- *well positioned for the next steps* – providing a stepping stone to other integrative and strategic modes of analysis;
- *recognizably successful* – providing demonstrable benefits in the form of ecologically sound development, and fostering the inculcation of new policy values; and
- *well suited to future capacity building* – providing a 'hands on' means of professional and institutional strengthening.

However, while EIA has evolved as a comprehensive and versatile instrument for development planning and resource management, it alone can not solve the serious global and regional problems caused by accelerated economic growth. It is recognized that conventional project EIA may, because of its narrow focus, actually limit responses to these problems. Also, although project EIA when undertaken according to existing standards of good practice already incorporates some analysis of cumulative effects, it is a somewhat limited approach, relying as it does on the triggering of individual projects. It is more cost-effective if EIA principles can be incorporated in higher level decisions about policies, plans and regional strategies which then give rise to individual projects. There is now general agreement on the need to adopt a more integrated approach to deal with the multiple causes of environmental degradation. New tools, such as strategic environmental assessment (SEA), natural resource accounting and sustainability assessment, are emerging to supplement and/or complement the EIA process. These tools, along with EIA, should not be developed as extra layers of appraisal but should be integrated into an overall coordinated approach to environmental planning and management.

While there is no agreed definition as yet of SEA, there is a consensus about its need, both at broad policy level and for more specific programmes and development plans, if the goals of sustainability are to be reached. There is also agreement on what information decision-makers can expect when SEAs are successfully incorporated into planning processes. These include:

2

- an overview of the policy or plan;
- its main objectives;
- how it will influence projects;
- existing environmental policies, goals and standards;
- mitigation measures and alternatives;
- environmental consequences of the proposed policy options;
- relationship to further decision-making and requirements for later EIAs;
- any difficulties and uncertainties and what these could mean for the planning process; and
- terms and conditions for implementation.

Adapted from Sadler and Verheem, 1994

From the above, it can be seen that SEA is a logical extension of the processes which have been described in detail in the manual.

Sadler (1995, 1996) in various reports relating to the International Study of the Effectiveness of Environmental Assessment has identified a number of short, medium and long term challenges for EIA if we are to meet society's needs in terms of sustainability (see boxes below). Those in the process of creating or modifying EIA systems have the opportunity to take the lead in adapting existing EIA systems to meet these future needs.

3

Box 1: Immediate and short term challenges for EIA

EIA must address problems or issues arising from:

- the large scale cumulative effects and trans-boundary management of common property resources eg. contamination of the Mediterranean Sea, circumpolar Arctic and the Great Lakes;
- global commons (in addition to biodiversity and climate change);
- international trade and assistance (start already made in this area);
- investment and financial reform packages (eg. structural adjustment funds);
- environmental liability and insurance decisions (eg. site, facility and property assurance);
- rehabilitation, remediation and restoration of contaminated sites, degraded lands, etc;
- decommissioning or replacement of large scale infrastructure (eg. Brent Spar);
- life cycle analysis of industrial process (eg. closing pollution-emission loops);
- agriculture and forest management, land conversions from lower to higher density uses;
- integrating habitat and green space into development patterns (to achieve 12% set aside).

Sadler, 1996

4

Box 2: Medium term challenges for EIA

In the medium term (eg. over the next ten years to 2006) the challenges are set by bigger picture trends including:

- globalisation – the world market place (increasing resource pressures, need for EIA standards);
- democratisation – not only new democracies but new modes of approach (new consultation techniques, also do-it-yourself EIA checklists for householders and consumers);
- deregulation – reducing the role and control of the public sector (continued shift from 'command' to 'monitor and spot check' approach, increased emphasis on policy assessment);
- privatisation – selling off utilities/operations that were formerly government owned (reinforces the need for nationally/internationally agreed EIA standards);
- downsizing of government – the requirement to do more with less (decentralisation of EIA responsibilities to local authorities, small and medium enterprises and individuals);
- cost-recovery – getting proponents to pay for EIA as a consequence of downsizing (increases pressure for process efficiencies, fast-track approaches and methodologies).

Sadler,1996

5

Box 3: Long term challenges for EIA

In the long term (eg twenty-five years to 2021) the emerging challenges and opportunities for EIA are those related to strengthening EIA as a mechanism for sustainability assurance, that is, redirecting the aim and approach of EIA to ensure that development planning is consistent with a precautionary approach to maintaining the regenerative and assimilative capacities of natural systems. This requires that the key principles for sustainability be adopted as guiding principles for EIA.

Key sustainability principles

- precautionary principle – err on the side of conservation as a hedge against irreversible or highly damaging changes
- anticipate and prevent – less dangerous and much cheaper than react and cure
- stay within the source and sink constraints – resource use/harvest within regenerative capacity, pollution/waste output within assimilative capacity
- maintain natural capital at or near current levels – no aggregate/net loss or drawdown of resource stocks or ecological diversity (requires impact compensation-no net loss principle)
- as far as possible, avoid conversion of land use from less intensive to more intensive uses (eg wildland>agriculture>urban/industrial)
- polluter-pays principle – full costs for environmental damage must be borne by users eg. industry and consumers (requires full cost analysis)

Sadler, 1996

Complete this segment by drawing the group's attention to *EIA: Issues, Trends, and Practice*, highlighting the detailed discussion of SEA, together with other important trends and issues.

Also encourage further networking among those involved in EIA and the use of electronic networks such as those listed in the *Contacts* section at the front of this Manual to establish contacts, access new case studies and to download other information and training materials. Give directions for accessing these networks (see verso of the Manual title page for details).

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

Bisset, R (1996) *EIA: Issues Trends and Practice*, Environment and Economics Unit UNEP. Nairobi

Sadler, B. (1996) *Final Report of the International Study of the Effectiveness of Environmental Assessment*. CEAA and IAIA. Canada

Sadler, B. and Verheem, R. (1994) *Strategic Environment Assessment: Draft Discussion Document*. Presented to the SEA Workshop, 15-16 December, 1994. The Hague, Netherlands

Further reading

Bregha, F., Bendickson, J., Gamble, D., Shillington, T., and Weick, E. (1990) *The Integration of Environmental Considerations into Government Policy*. Canadian Environmental Assessment Research Council, Hull, Quebec

Lee, N., and Walsh, F. (1992) Strategic Environmental Assessment: An Overview, *Project Appraisal.*, vol 7(3), pp 126-136

Partidario, M. R. (1996) SEA- Key Issues from Recent Practice. *Environmental Impact Assessment Review*, vol 16(1), pp 31-55

Therival, R., Wilson, E., Thompson, S., Heany, D., and Pritchard, D., (1992) *Strategic Environmental Assessment*. Earthscan, London

Wood, C. and Djeddour, M (1992) Strategic Environmental Assessment: EA of Policies, Plans and Programmes. *Impact Assessment Bulletin*. vol 10(1):3-21

Training activities

Training activities may be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

13–1 What changes (in society, environmental quality etc) could alter the short, medium and long term challenges for EIA, or their relative priority?

13–2 What factors do you feel will have the most influence in the way in which EIA develops in the next five to ten years?

13–3 What impediments are there to changing of EIA systems? Are there ways in which these impediments could be lessened?

13–4 Identify some of the implications of long term sustainability issues for development and EIA systems. What can be done to facilitate the incorporation of sustainability criteria into development planning and implementation?

Speaker themes

13–1 Invite a speaker to outline the local, regional and global challenges that EIA will be expected to meet in the next ten years.

1 **Moving towards sustainability:**

- EIA is a foundation tool
- EIA is well positioned for the next steps
- EIA is recognizably successful
- EIA is well suited to future capacity building

2 **Decision-making information provided by SEAs:**

- overview of policy or plan
- objectives
- how it will influence projects
- existing environmental policies, goals and standards
- mitigation measures and alternatives
- environmental consequences of policy options
- relationship to further decision-making and later EIAs
- difficulties, uncertainties and their implications
- terms and conditions for implementation

3 **Immediate and short term challenges for EIA:**

- large scale cumulative effects and trans-boundary management of common property resources
- global commons
- international trade and assistance
- investment and financial reform packages
- environmental liability and insurance decisions
- rehabilitation, remediation and restoration of contaminated sites, degraded lands, etc;
- decommissioning or replacement of large scale infrastructure
- life cycle analysis of industrial process
- agriculture and forest management, land conversions from lower to higher density uses;
- integrating habitat and green space into development patterns

4 **Medium term challenges for EIA**

- globalisation
- democratisation
- deregulation
- privatisation
- downsizing of government
- cost-recovery

5

Long term challenges for EIA – adopting sustainability principles

- precautionary principle
- 'anticipate and prevent' – not 'react and cure'
- use/harvest within regenerative capacity, pollution/waste output within assimilative capacity
- maintain natural capital at or near current levels
- avoid conversion of land use from less intensive to more intensive uses
- polluter-pays principle

Moving towards sustainability:

- EIA is a foundation tool
- EIA is well positioned for the next steps
- EIA is recognisably successful
- EIA is well suited to future capacity building

Decision-making information provided by SEAs:

- overview of policy or plan
- objectives
- how it will influence projects
- existing environmental policies, goals and standards
- mitigation measures and alternatives
- environmental consequences of policy options
- relationship to further decision-making and later EIAs
- difficulties, uncertainties and their implications
- terms and conditions for implementation

Immediate and short term challenges for EIA:

- large scale cumulative effects and trans-boundary management of common property resources
- global commons
- international trade and assistance
- investment and financial reform packages
- environmental liability and insurance decisions
- rehabilitation, remediation and restoration of contaminated sites, degraded lands, etc;
- decommissioning or replacement of large scale infrastructure
- life cycle analysis of industrial process
- agriculture and forest management, land conversions from lower to higher density uses;
- integrating habitat and green space into development patterns

Medium term challenges for EIA

- globalisation
- democratisation
- deregulation
- privatisation
- downsizing of government
- cost-recovery

Long term challenges for EIA - adopting sustainability principles:

- precautionary principle
- 'anticipate and prevent' - not 'react and cure'
- use/harvest within regenerative capacity, pollution/waste output within assimilative capacity
- maintain natural capital at or near current levels
- avoid conversion of land use from less intensive to more intensive uses
- polluter-pays principle

Acronymns

AEAM	adaptive environmental assessment and management
AEC	African Economic Community
CBA	cost benefit analysis
CEA	cumulative effects assessment
CIA	cumulative impact assessment
CEAA	Canadian Environmental Assessment Agency
CEQ	US Council of Environmental Quality
EC	European Community
ECE	Economic Commission for Europe
EIA	environmental impact assessment
EIS	environmental impact statement
EMP	environmental management plan
EMP	environmental monitoring plan
EMS	environmental management strategy
EMS	environmental management system
EO	environmental overview
EPA	Environment Protection Agency
ESCAP	Economic and Social Commission for Asia and the Pacific
FONSI	finding of no significant impact
GEF	Global Environment Facility
GIS	Geographical Information System
HIA	health impact assessment
IAIA	International Association for Impact Assessment
IAMM	impact assessment, monitoring and management
IRM	integrated resource management
MASAQHE	major action significantly affecting the quality of the human environment
NEAP	National Environmental Action Plan
NEPA	National Environmental Policy Act
NEQA	National Environmental Quality Act (Thailand)
NGOs	Non-government organisations
NSDS	national sustainable development strategies
OECD	Organization for Economic Cooperation and Development
PADC	project appraisal for development control system
PFF	project formulation framework
SAP	structural adjustment programs
SEA	strategic environmental assessment
TNA	training needs analysis
ToR	terms of reference
UETs	ultimate environmental thresholds
UNCED	United Nations Conference on Environment and Development (1992)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
VECs	valued ecosystem components
WCS	World Conservation Strategy

Glossary

abiotic

Non-living eg rocks or minerals.

ameliorative measures

See mitigation.

alternative

A possible course of action, in place of another that would meet the same purpose and need of the proposal.

audit

See environmental audit.

baseline studies

Work done to collect and interpret information on the condition/trends of the existing environment.

benefit-cost analysis

A method of comparing alternative actions according to the relative costs incurred (technical, environmental and economic) and the relative benefits gained. The analysis can incorporate discounting calculations to take into account the time value of money.

biodiversity

See biological diversity.

biological diversity

The variety of life forms, the different plants, animals and micro-organisms, the genes they contain and the eco-systems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.

biophysical

That part of the environment that does not originate with human activities (eg biological, physical and chemical processes).

biota

All the organisms, including animals, plants, fungi and micro-organisms in a given area.

carrying capacity

The rate of resource consumption and waste discharge that can be sustained indefinitely in a defined impact region without progressively impairing bioproductivity and ecological integrity.

coherence in EIA

Aiming to achieve the co-ordination of EIA procedures, guidelines, standards and criteria by those involved in funding or approving proposals.

compensation

Trade-offs between different parties affected by proposals to the mutual satisfaction of all concerned.

cost-benefit analysis

See benefit-cost analysis.

cumulative effects assessment

The assessment of the impact on the environment which results from the incremental impact of an action when added to other past, present or reasonably foreseeable actions regardless of what agency or person undertakes such actions. Cumulative impact can result from individually minor but collectively significant actions taking place over a period of time.

decision-maker

The person(s) entrusted with the responsibility for allocating resources or granting approval to a proposal.

development proposals

Consists of a wide range of human activities which provide (a) favourable conditions for an increase in the transformation of the natural, biophysical environment to provide the goods and services available to society (eg. Structural adjustment programs, 'rolling' development plans) and (b) actions which directly produce the goods and services.

discretionary process/decision

A process or decision which the decision-maker is able to base on personal preference.

ecological processes

Processes which play an essential part in maintaining ecosystem integrity. Four fundamental ecological processes are the cycling of water, the cycling of nutrients, the flow of energy and biological diversity (as an expression of evolution).

ecosystem

A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.

endemic

Restricted to a specified region or locality.

environment

There is no generally agreed definition of environment in EIA. Increasingly, it means the complex web of inter-relationships between abiotic and biotic components which sustain all life on earth, including the social/health aspects of human group existence.

environmental audit

Process focusing on an existing installation, facility, or activity which involves a systematic, periodic evaluation of environmental management to objectively review the performance of an organisation, management and equipment with the aim of safeguarding the environment.

environmental assessment

See environmental impact assessment.

environmental impact assessment (EIA)

The systematic, reproducible and interdisciplinary identification, prediction and evaluation, mitigation and management of impacts from a proposed development and its reasonable alternatives. Sometimes known as environmental assessment.

environmental impact report/statement

Document in which the results of an EIA are presented to decision-makers and, usually, the public.

environmental management

Managing the productive use of natural resources without reducing their productivity and quality.

environmental management plan

See impact management plan.

environmental management system

A structured approach for determining, implementing and reviewing environmental policy through the use of a system which includes organisational structure, responsibilities, practices, procedures, processes and resources. Often formally carried out to meet the requirements of the ISO 14000 series.

fauna

All of the animals found in a given area.

flora

All of the plants found in a given area.

health impact assessment

Component of EIA which focuses on health impacts of development actions. Most attention is concentrated on morbidity and mortality, but increasingly, the World Health Organization (WHO) definition of health as being a state of 'social, physical and psychological well-being and not just the absence of disease' is being used to guide this type of assessment work.

impact management plan

A structured management plan that outlines the mitigation, monitoring and management requirements arising from an environmental impact assessment.

impact monitoring

Monitoring of environmental/social/health variables, which are expected to change after a project has been constructed and is operational, to test whether any observed changes are due to the project alone and not to any other external influences.

initial environmental evaluation/examination

A report containing a brief, preliminary evaluation of the types of impacts that would result from an action. Often used as a screening process to assess whether or not proposals should undergo full scale EIA.

interdisciplinary team

A group of people, from a range of disciplinary backgrounds, working together to ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment.

level of assessment

See tiering.

memoranda of understanding

A written agreement between two or more levels or areas of government.

mitigation

The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment.

monitoring

Activity involving repeated observation, according to a pre-determined schedule, of one or more elements of the environment to detect their characteristics (status and trends).

'moving' baseline

Existing state of the environment projected into the future assuming no development proceeds. The projected baseline situation, rather than that existing at the time of EIA work, is theoretically the one to be compared with the state of the environment predicted in the event of a development action proceeding.

natural resources

Features that have ecological, economic, recreational, educational or aesthetic value.

natural resource accounting

Transformation of data, on environmental features (components and processes) and renewable/non-renewable resources, into a form that is comparable with data on the economy. Incorporation of the environmental data into the standard set of economic accounts (eg. gross national product) used in government policy-making.

NEPA

National Environmental Policy Act 1969 of the United States of America. This Act, which applied to Federal US agencies, was the first policy to require the preparation of a statement of the predicted environmental impact of a proposal. This statement has since become known as the Environmental Impact Statement (EIS).

precautionary principle

A principle of sustainability that where there are threats of serious or irreversible damage, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

proponent

Organisation (private or public sector) or individual intending to implement a development proposal.

proposal

Any project, policy, program, plan or other activity.

public consultation

See public involvement.

public involvement

A range of techniques that can be used to inform, consult or interact with stakeholders affected by a proposal.

resource

Anything that is used directly by people. A renewable resource can renew itself or be renewed at a constant level. A non-renewable resource is one whose consumption necessarily involves its depletion.

risk analysis

Technique used to determine the likelihood or chance of hazardous events occurring (such as release of a certain quantity of a toxic gas) and the likely consequences. Originally developed for use in nuclear and chemical industry where certain possible events, of low probability, could have extremely serious results. Attempts are being made to use concepts from probabilistic risk analysis to characterise environmental impacts, whose occurrence and nature are not easy to predict with any degree of accuracy.

secondary impact

Indirect or induced changes in the environment, population, economic growth and land use and other environmental effects resulting from these changes in land use, population and economic growth. The potential effects of additional changes that are likely to occur later in time or at a different place as a result of the implementation of a particular action.

scoping

An early and open activity to identify the impacts that are most likely to be significant and require investigation during the EIA work. Can, also, be used to:

- identify alternative project designs/sites to be assessed;
- obtain local knowledge of site and surroundings; and
- prepare a plan for public involvement.

The results of scoping are frequently used to prepare a Terms of Reference for the EIA.

screening

Preliminary activity undertaken to classify proposals according to the level of assessment that should occur.

social impact assessment

The component of EIA concerned with changes in the structure and functioning of social orderings. In particular the changes that a development would create in: social relationships; community (population, structure, stability etc); people's quality and way of life; language; ritual; political/economic processes; attitudes/values. Can sometimes include health impacts.

stakeholders

Those who may be potentially affected by a proposal eg: local people, the proponent, government agencies, NGOs, donors and others.

State of the Environment reports

Reports that provide an assessment of the conditions of the environment, pressures on the environment and the responses of the environment to those pressures.

strategic environmental assessment

An EIA-like appraisal procedure that examines the likely environmental impacts of proposed policies, programmes and plans.

synergistic

By acting together, separate elements produce a greater effect than would be produced if they acted separately.

tiering

Addressing issues and impacts at the appropriate level of decision-making (eg from the policy to project levels).

Terms of Reference (ToR)

Written requirements governing EIA implementation, consultations to be held, data to be produced and form/contents of the EIA report. Often produced as an output from scoping.

transboundary impacts

Any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party.

value judgement

The use of opinion or belief in analysis or decision-making.

Subject	Topic Number
alternatives	5, 6
analysis of impacts	6
assessment	6
audit	11
baseline data, studies	5, 6
budgeting	12
checklist	6
coherence between donors	2
community involvement	3
cumulative effects/impacts	2, 6
data collection	11
decision analysis	6, 10
decision-making	10
design	7
direct impacts	6
economic	2
environmental impact assessment (EIA)	
methods	6
procedures	1, 2
EIA reports	
writing	8
reviewing	9
environmental impact statement (EIS)	8
environmental management plan	7, 11
expert systems	6
geographic information system (GIS)	6
impact analysis	6
impact assessment	6
impact identification	1, 6
impact significance	6
impacts - different types	1, 6
law	2
matrices	6
mitigation	7
modelling	6
monitoring	11
multi-criteria analysis	6
networks	6
policy	2
project management	12
public involvement	3
public participation	3

reporting 8
reviewing EIA reports 9
risk 6
scheduling 12
scoping 5
screening 4
indirect impact 1, 6
significance 4, 6, 10
social impact assessment 2
strategic environmental assessment 2
sustainability 1, 9
sustainable development 1, 9
Terms of Reference 5, 9
values/ value judgements 3, 6, 10
weighting 6